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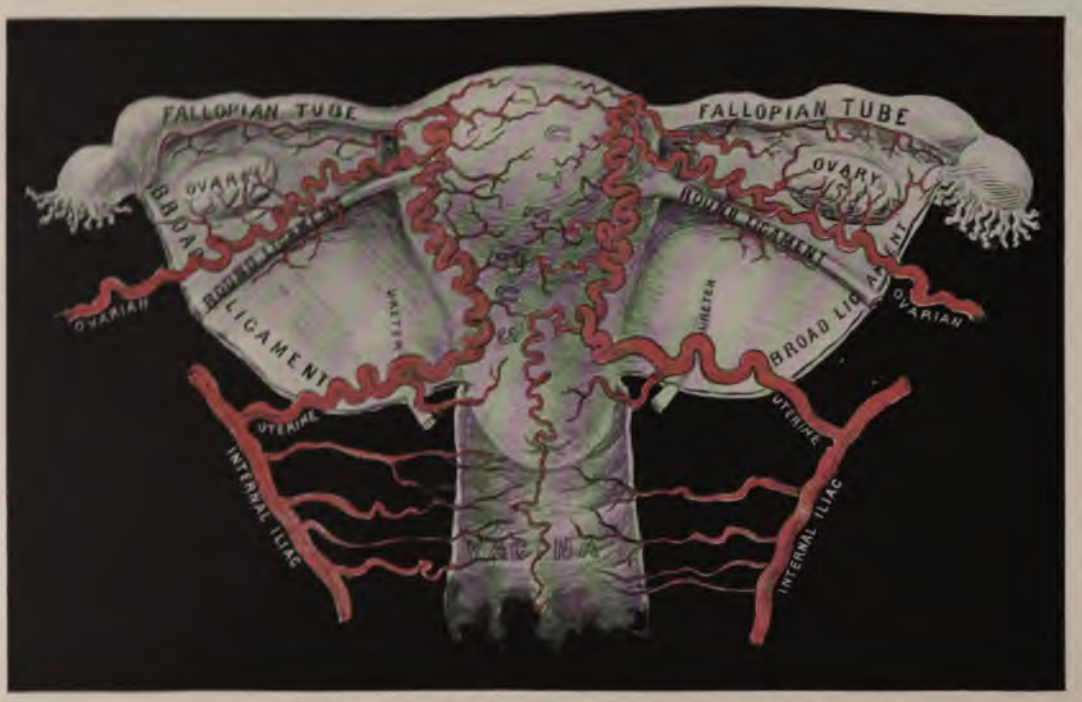

ARTERIAL SUPPLY OF THE GENITAL APPARATUS.

A TEXT-BOOK

OF

PRACTICAL GYNECOLOGY

FOR PRACTITIONERS AND STUDENTS

BY

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PREFACE TO THIRD EDITION.

A THIRD edition of Practical Gynecology following so closely on the second gives little opportunity for extensive changes in the text. Nevertheless many sections have been retouched and some almost entirely rewritten. The most extensive changes have been made under the heads of drainage and of septic peritonitis, where the most recent established facts and methods in relation thereto have been embodied. The conspicuous advantages of the solid glass stem pessary in the treatment of dysmenorrhea, amenorrhea, and some trophic disturbances of the uterus are set forth in due order. By careful pruning and studied diction I have been able to make these changes without in any way interfering with the original plan or size of the work. In this, as in former editions, I am indebted to my son, Dr. E. M. Gilliam, Professor of Gynecology, Starling-Ohio Medical College, for most of the labor connected with the revision.

D. T. G.

50 NORTH FOURTH STREET.
COLUMBUS, OHIO.

C 1893

PREFACE TO FIRST EDITION.

I HAVE endeavored to make this book plain and practical for the student and busy practitioner. I have dispensed with bibliographic references, and have made few citations of authorities. Moot questions have been given scant attention, and effete matter has been excluded. In the choice of technique I have aimed to give sufficient variety to meet the varied requirements and no more. Scientific methods in classification and arrangement have not been strictly adhered to whenever, in my judgment, a plain, connected narrative would render the text more intelligible.

The book is divided into fifty chapters of as nearly uniform length as possible to correspond to the number of lectures and recitations usually allotted to the subject during a collegiate term.

I am indebted to Dr. J. H. J. Upham for the chapters on the ureters and kidneys, and to Dr. Earl M. Gilliam for the chapters on the rectum and much other valuable assistance in the preparation of the work. To the artist, Mr. Robert Bowie, I am under obligations for faithful and efficient work in the preparation of the illustrations.

D. T. G.

50 NORTH FOURTH STREET,
COLUMBUS, OHIO.

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PRACTICAL GYNECOLOGY.

INTRODUCTORY.

GYNECOLOGY is the science that treats of the diseases peculiar to woman. As a special and distinct branch of medicine, gynecology is of comparatively recent birth. Not many years ago all that was known and done in this line belonged to the province of general medicine. The practice of gynecology consisted, for the most part, in replacing the malposed uterus, the adjusting of pessaries, and the application of remedies to the cervix and uterine canal. The evolution of gynecology into a distinct branch is due largely to the genius, enterprise, and indomitable courage of our own illustrious Sims. He is spoken of as the father of gynecology. The evolution of the branch has been rapid and marvelous. It has developed from a small bud on the body medical to a great overshadowing branch second in magnitude and importance to that of general surgery alone. Indeed, it has become distinctively surgical in all its aspects, and is more closely allied to general surgery in scope and character than any of the so-called specialties. America claims not only the distinction of giving birth to this great and beneficent specialty, but has maintained her position in the front rank of discovery and operative technique. At the same time our countrymen have been swift to adopt the views and practices of foreigners from any source whatever, when such have been found to be in the line of progress. The gynecologist of the last quarter of a century has been exceedingly active and aggressive, and it is to him we are indebted for many of the most wonderful achievements of surgery. It was he that taught us the practicability and unfolded the wonderful possibilities of abdominal surgery. Once in the abdomen, he did not confine his sphere to the uterus and

appendages, but, finding himself confronted by pathologic and abnormal conditions of other organs, made bold to attack the same, and by persevering effort obtained the mastery. Thus it is that he now not only removes the uterus and appendages, with their multifarious growths and pathologic conditions, but includes therewith the surgery of the intestines, stomach, liver, spleen, and kidneys. The gynecologist must of necessity be an abdominal surgeon, and as such allows no imaginary line to bound his sphere.

CHAPTER I.

GENERAL CAUSES OF DISEASES IN WOMAN.

THE foundation for much of the suffering of woman is laid in childhood and adolescence. If the process of development is seriously interfered with at this period, the individual will never attain to that degree of physical and mental vigor to which she is entitled. It must not be forgotten that the mental and moral natures are intimately associated with and dependent on the physical. The apparent exceptions to this rule, as sometimes seen in interesting invalids, are only apparent, and if closely analyzed will disclose the fact that the mentality is of that scintillating type, and the morality of that fervid type, which are closely allied to aberration. The sound, evenly balanced mind belongs to a sound body. Not only is a sound body essential to a sound mind, but sound morals as well. It is a fact not generally understood that the moral being is inherently interwoven with and closely dependent on the physical. An individual who, by reason of physical infirmity, is deprived of the legitimate pleasures incident to a healthy body is very prone to seek for them in other and forbidden channels. To a perfectly healthy man or woman mere existence is a pleasure, and they are usually content with existing conditions. The North American Indian is kinder to his female children than we are to ours. With him the children of both sexes are on equal terms. With us the female almost from the cradle is placed under a different *régime* from her brother. Taught to observe the proprieties from early childhood, she is denied the health-giving pleasures of the rougher sports. Her brother comes in from his play with glowing cheeks and a ravenous appetite, and when he seeks his couch it is to fall into a deep and refreshing sleep. She spends most of her time within four walls, is done up in stays and tight-fitting clothes, has little in the way of recreation, and that of the tamest sort, and to cap the climax is placed under tutorage at a tender age and is expected to compete with her sturdy brother in mental attainment. And what is the result? Simply that which might be expected: a frail and delicate body, a high-strung and unstable nervous organization, and a hot-house brain. She has been reared and educated for invalidism, incapacity, and life-long suffering.

Happily the conditions portrayed above are not so prevalent to-day as they were a generation ago, and it is devoutly to be hoped that the reformation may continue until our women shall be bequeathed at least the same degree of health, strength, and vigor as her uncivilized cousin. There can be no reasonable objection to schools and mental training for the girl any more than for the boy, provided she be given the same opportunity for physical culture, and that cognizance be taken of her inherently more impressionable nature. Due allowance should also be made for that very critical period of her existence which comes with the establishment of the menstrual function. It should be continually borne in mind that the transition period from girlhood to womanhood is much more important and freighted with weightier consequences than the same period in the male. It not only calls upon her normal energies, but makes heavy draught on her reserves; so that a diversion of these energies often works disaster. Competitive examinations and examinations for grade are among the most pernicious features of our school system, and should be abolished.

SOCIAL STATE.

Altered conditions of life and the social state are often responsible for the ills of woman. It is said that the African negro woman in her natural state and habitat is seldom, if ever, afflicted with uterine fibroma. Transplanted to this country and surrounded by the environments of civilized life, she becomes exceedingly prone to it. Women who change their mode of life often suffer from menstrual disorders. A sea-voyage will not infrequently cause a stoppage of the menstrual flow for many months. As between marriage and celibacy there is little to choose. Married women are more prone to cervical cancer and the various accidents incident to parturition, such as laceration of the cervix and perineum, subinvolution, cystocele, rectocele, and prolapsus uteri. Single women and sterile married women are more subject to uterine fibroids and cancer of the body of the uterus. Celibacy brings its own train of evils incident to an unnatural mode of life.

Malformation of the Female Sexual Organs due to arrest of development plays a rôle in the production of the diseases of women. Atresia of the vagina or uterine canal, with retention of the secretions and menstrual fluids, is one of the most common examples of disturbance arising from this cause.

Septic and Specific Infections are among the most common causes of disease in the female. A very large percentage of her ailments are traceable to one or the other of these causes. Septic infection occurs as the result of unclean handling of or operations on the genital organs or as the result of abortion or labor at term. It is almost without exception due to carelessness or ignorance on the part of the nurse or medical attendant. Gonorrheal infection is especially prevalent, and gives rise to some of the most serious ailments to which woman is heir. Both septic and gonorrheal infection may start in the lower genitals and by extension involve the entire genital apparatus, with the most disastrous results.

PHYSICS AND PHYSIOLOGY AS APPLIED TO GYNECOLOGY.

It has been said that the genital apparatus of woman is the pivotal point around which her life revolves. This, while measurably true, should not be taken too literally, lest it lead to a dwarfed conception of the scope and character of this branch of medicine. It should not be forgotten that the genital apparatus of woman is under the dominance of the same laws that govern the general economy; that gynecology is not an isolated entity, but is closely allied to and intimately interwoven with general medicine. The man who limits his field of vision to the genitals of woman and gauges his practice accordingly will always remain a pigmy in his profession and a discredit to himself and his calling. Let it be understood and ever borne in mind that sound genitals belong to a sound woman, and that a sound woman is the product of heritage and a properly regulated life. Firmness of fiber, symmetry of form, grace, and beauty are all heritages of healthful habits and environment.

Of all agencies which contribute to cell- life and energy, which multiplied means somatic life and energy, there is none that compares with the blood and its supply. The ancient *dictum* that the blood is the life has a broader significance than is usually accredited to it. Sudden and complete withdrawal of the blood from the tissues leads to speedy death; incomplete blood-supply leads to structural degeneration and functional incapacity. The blood is both food and air to the tissues, and it is the scavenger as well. It conveys the life-giving principles and takes away the effete and poisonous products of metabolism.

The blood to fulfill its destiny must be in circulation; stagnant blood can neither act as purveyor nor scavenger. Aside from the

heart's impulse, the circulation of the blood is promoted in many ways. Chief among the aids to circulation are pressure upon or contraction of organs, muscular action, and the movements of respiration. These are sometimes merged, but can best be considered under separate heads.

1. Pressure Upon or Contraction of Organs.—Beginning at the distal extremity of the circulatory apparatus,—that is, in the organs or tissues,—pressure or squeezing gives the initial impulse to the circulating fluids, empties the lymph-spaces, and presses the fluids forward into the venous radicles and lymph-channels. With the succeeding relaxation—for it must be understood that the pressure to be effective must be intermittent—the freshly charged blood pushes in, fills all the ramifications of the capillary system, and discharges its freight of food and oxygen into the tissues.

2. Muscular Action.—Muscles in action contract, swell up, and become firm. In so doing they compress the veins and displace the blood, which, owing to the system of valves with which they are provided, can only go in one direction: that is, toward the heart. This, like the foregoing, to be efficient must be intermittent, as steady pressure prevents the refilling of the veins and hinders rather than facilitates the circulation. This accounts for the fatigue resulting from standing.

3. Movements of Respiration.—The movements of respiration are duplex, and affect alternately the two great cavities: the thoracic and abdominal. With inspiration the chest expands, the diaphragm descends, and the abdominal and pelvic viscera are displaced downward. With the expansion of the thoracic cavity there is a coincident contraction of the abdominal, due to the descent of the diaphragm. This causes an increased intra-abdominal pressure, in which the viscera are squeezed and emptied of their contents and the vessels compressed as in muscular action. Synchronously with the expansion of the chest the thoracic vessels are dilated and the blood drawn into them. In expiration the chest contracts, forcing the blood into the heart, while at the same time the abdomen expands, allowing the abdominal vessels to refill from those in the extremities.

Another effect of the alternate movements of respiration is the alternate ascent and descent of the abdominal and pelvic viscera. If the perineum be retracted and the cervix uteri exposed to view, its upward and downward movements corresponding to those of respiration become conspicuously manifest. They are depressed in

inspiration and lifted upward in expiration, the upward movement of the diaphragm exerting a suction force. This suction force, which is otherwise known as the retentive power of the abdomen, will be more fully considered in connection with the uterine displacements. The movements of the viscera would be much more conspicuous if the abdominal walls were rigid and unyielding, and as it is they are largely influenced by their firmness and resiliency. The effect is to give exercise to the muscles and ligaments contributing to their vigor and strength, and the rhythmical impact of one viscus upon another acts as a gentle massage. It will be seen then how important to the welfare of the individual is the unrestrained play of the forces under consideration.

This leads us to the subject of dress.

DRESS.

The object of clothing is to protect the body from the extremes of heat and cold, from wind and water, from mechanical and chemical irritants with which it may be brought in contact or which may be brought in contact with it. Esthetically, clothing is worn to cover nakedness and as an adornment. The ideal dress should be as light as compatible with comfort, and dry and clean. In weight and quality it should be adapted to the climate and season. The under-garments especially should be open-meshed, to provide for ventilation and give ready exit to the exhalations of the body. They should be elastic to accommodate the various postures of the body, and there should be no constriction to hamper movement, embarrass circulation, or interfere with muscular action. The clothing should be evenly distributed and protect all parts. Thinly clad or bare extremities with a surplus of clothing about the hips is bad hygiene. Beauty of dress, so called, should give way to utility and healthfulness.

But our ideas of beauty are largely influenced by habit and education. A pretty girl in a bizarre habit would not be pleasing to the eye and would excite unfavorable comment, but if all the girls were to adopt a like habit it would not be many months until we should begin to look upon it with favor. The fact is, it is the woman that adorns the dress, and if by virtue of this fact man can be brought to endure or even admire a habit of dress that is pernicious and conceals the real beauty of form, that hampers and distorts it, how much more would he revel in a garb conducive to health and comfort, normal development, and unrestrained movement!

It augurs well for women that in late years there has been an effort in the direction of dress reform. It is unusual now to see a woman tightly laced or with high-heeled, tight shoes. Garters are almost a thing of the past. Still, there is room for improvement, and the crusade against unhygienic dress should never be abandoned until the ideal is attained. Many women wear high and close-fitting collars. These, by pressure upon the windpipe, the cervical vessels, and muscles give rise to embarrassed respiration, headache, disturbance of vision, and cerebral congestion. The neckwear should never come higher than the middle of the neck, and should not be close fitting. It may be supplemented, when necessary, by a scarf loosely applied.

The most serious fault of the conventional dress of to-day is the constriction and immobilization of the middle portion of the trunk by means of waist-bands and corset. By constriction of the waist and in proportion to the tightness of constriction the breathing capacity of the chest is diminished, the upward and downward play of the diaphragm inhibited, the underlying viscera compressed, the abdominal contents forced downward, which in turn crowd upon, confine, and immobilize the pelvic viscera, and in general derange the normal physiologic processes dependent on unrestrained action as set forth in the preceding section. The corset splints the chest and abdomen to the extent of its length, abridging muscular action and destroying natural flexibility. As a result, the trunk-muscles lose tone and become atrophied. They are incapable of performing the functions for which they were intended, and the woman becomes dependent on the corset for support. She has a weak back, and collapses when the artificial support is removed. Handicapped by such restrictions, she is not disposed to attempt healthful exercise, from which, under the circumstances, she could at best only receive scant benefit.

Exaggerated portrayal of the evils resulting from the use of waist-band and corset can avail nothing. The best way to antagonize evil is by truthful delineation of its effects. Everybody knows that women survive these incumbrances and in many instances enjoy a fair degree of health. This is due, in part, to the fact that woman is a chest breather; that diaphragmatic respiration is not so necessary to her as to man. This is a provision which adapts her to the office of maternity. With her a full-term pregnancy, which not only fills, but distends the abdomen does not greatly embarrass respiration, and it is a notable fact that tumors and dropsical effusions of

the abdomen are much better borne by her than by man. Her immunity is furthermore due to the resourcefulness of Nature, whereby apparently insurmountable difficulties are met by expedients well known to the pathologist. Instance the collateral circulation by which Nature averts the evils of an occluded blood-vessel. Nevertheless a woman cannot violate the laws of health with impunity. The day of reckoning will come and is here, though she does not realize it. Civilized woman is not what she ought to be nor what she might be, by reason of dereliction in dress. The subversion of physiologic processes tends to physical degeneration and loss of strength and endurance. It strongly predisposes to disease, and reduces her to a condition of semi-invalidism. Women of this type sometimes make interesting invalids, but the pallid, languid, nerve-racked beings who pose as such are in no wise comparable to the splendid specimens of bright-eyed and buoyant womanhood as we get them from the hand of Nature.

The proper dress of woman should consist of one, and usually two, layers of clothing which conform to the shape of the body including the lower extremities. This is necessary in order to protect that portion of the body below the waist-line from the under-currents of air which sweep up under the skirts. The under-garment should be of one piece,—a union suit,—and should be made to fit snugly at the ankle. The material should be open-meshed, and consist of wool, silk, or linen. The superincumbent clothing may be in one or two pieces, but should be directly or indirectly hung from the shoulders, and preferably so fashioned as to distribute their weight and support as evenly as possible over the surface of the body. A good part of the weight may be borne by the hips. There should be no waist-bands. In a woman with normal development of the trunk-muscles there can be no reasonable objection to suspending all the clothing from the shoulders. The ungirded flowing robes of the maids and matrons of ancient Greece were picturesque and beautiful and incomparably more attractive than the dress of to-day. Trailing skirts, however, should not be used for street-wear, as they gather up the tuberculous sputum and other germ-infested media, which after drying are brushed off in the living-room, to be thrown into the air with every sweeping. When women cannot be induced to discard waist-bands,—and to be candid there seems to be little probability of such a *desideratum* in the near future,—a short, loose corset is preferable, as it helps to sustain the clothing, wards off pressure, and to an extent diminishes constriction.

MUSCULAR EXERCISE.

American women are peculiarly derelict in muscular exercise. In this respect they compare unfavorably with the women of England and continental Europe. There are few things that contribute more to the physical and mental well-being of the individual than properly regulated exercise. Muscular exercise stimulates circulation, promotes oxygenation of the tissues, conduces to physiologic metabolism, develops the muscles, reduces fat, and increases the activity of the brain. In a test made at the Elmira Reformatory with twelve dull boys whose average in studies for the preceding six months was 45 per cent., a course of physical culture brought the average up to 74 per cent. "With physical culture," says Dr. Wey, "there came an awakening and cerebral activity never before manifested in their prison-life; the dull and stolid look gave way to a more intelligent expression, and the eye gained a brightness and brilliancy that before was conspicuous by its absence."

Physical exercise, to be of the greatest advantage, should be judicious and timely; it should be tempered to the individual and regulated as to time and duration. What would be a pleasurable recreation for one might be a harmful physical exertion for another. Active exercise should never be taken on a full or empty stomach or under conditions of great fatigue. It should never be so violent as to induce labored respiration nor so long continued as to produce exhaustion. Exercise under the restraint of improper clothing is bereft of half its benefits. It should always, if possible, be made an occasion of diversion and pleasurable emotion, and varied according to inclination. Solitary walks or monotonous processions with the sole object of exercise are too funereal to be of much benefit.

The best time for exercise is after rest, sleep, and refreshments: that is, in the morning. Walking, horseback-riding, bicycling, swimming, or even running in moderation are among the best exercises for general effect. Of these, walking has the greatest range of usefulness. Horseback-riding is exhilarating and salutary. The late Dr. Frank Hamilton used to say that one of the best things for a man's insides was the outside of a horse. Whenever the weather conditions permit, exercise is better taken in the open air. Women in full vigor and properly clad may brave the elements and take some form of out-of-door exercise in all conditions of weather. A light, airy chamber is the next best substitute for out-of-door exercise. Properly directed physical culture, dancing, or games requir-

ing the exercise of all the muscles, or even house-work, if engaged in with pleasurable zest, may be of great service. Weakly women and women of indolent turn should be inducted into habits of exercise by gradations. They will usually require restraint at first and encouragement later. Congenial company and emulation are strong incentives to exercise. Women with pelvic affections should refrain from active exercise during exacerbations of the same and during, immediately before, and after menstruation. Some women may not be able to engage in active exercise. For such, passive exercise or massage may be substituted.

CHAPTER II.

GYNECOLOGIC EXAMINATION.

As intimated in the preceding chapter, the gynecologist does not confine himself to the reproductive organs of the female. His domain extends from the diaphragm to the pudendum. Nor could he limit himself within narrower bounds if he would, for oftentimes through mistaken diagnosis, or from injury to or implication of other organs, he will be compelled to deal with them or retire ignominiously. Therefore in his examinations he must include the external organs of generation, the uterus and its appendages, and the entire abdominal region.

The first essential to a successful examination of affected organs is a thorough acquaintance with the normal anatomy and relation of parts, and a familiarity with them as acquired by the use of the various methods of examination. This is acquired only by protracted and painstaking effort. To the beginner, one part is very like another and their differentiation exceedingly difficult. It is, as aptly remarked by Morris, like seeking for the middle ounce of mush in a kettle of mush. The tyro in gynecology may have eyes and ears and touch as acute as his preceptor, and yet he will fail to note the pathologic changes or to distinguish one part from another. It is thus in all departments of life. A man in a strange city amid the medley of sights and sounds will not be able to distinguish the usual from the unusual. He will probably not even note the fire-alarm. He has eyes, but sees not; ears, but hears not; fingers, but feels not. In time and by practice the student begins to distinguish first one and then another of the points of differentiation, until finally, if persevering and earnest, he becomes proficient in the use of his senses and faculties in the mapping out of organs and the detection of pathologic changes.

The next essential is method. No man can become an expert and safe diagnostician unless he is habitually methodical. The man who is not methodical in his examinations will often overlook something of importance, and occasionally the main factor in the case. He must take nothing for granted, some very damaging blunders having been committed by excellent diagnosticians from negligence in this respect. The pregnant uterus has been mistaken for an ovarian

cyst, and many other mistakes of more or less serious import have been committed, not from incapacity, but because of inattention or carelessness. He must cultivate the habit of observation. He must always be on the alert; he must use all his senses at all times; and especially must he rely upon the sense of touch, for it is upon this he will have to depend more than all the others combined. It is remarkable to what degree the sense of touch can be developed. By the tips of his fingers the expert can develop a mind-picture of an organ as perfectly as though it lay exposed before his eyes. By this he can determine its size, shape, consistence, and position. It is a favorite saying among teachers that the would-be gynecologist must develop an eye on the end of his index finger.

It is good to keep a record of your cases, both for the purpose of engendering habits of accuracy and for future reference. Oftentimes the previous history of the case will be of great value. A record is also of value as a source from which to compile data and elaborate scientific deductions. It will entail some labor and take some time, but, once the habit is formed, it will fall in with the daily routine and cease to be a task. The record should be simple, and yet so elastic as to include all that is necessary. After much thought I have adopted the following, which answers the purpose quite well:—

CASE NO. 100. DATE January 1, 1903.

NAME Mary Smith. AGE 35.

RESIDENCE Columbus, O. SOCIAL STATE Married.

DIAGNOSIS Pyosalpinx—bilateral.

TREATMENT Double Salpingo-oöphorectomy.

DISCHARGED January 22, 1903. RESULT Recovery.

SEE PAGE

These forms, which contain the essential items common to all cases, constitute the body of the book, and are printed two on a page.

In the back part of the book a certain number of pages—say, one page to five of those described above—are reserved for a more complete description of the case. These pages are headed:—

FULL REPORT OF CASE NO._____ SEE PAGE_____

Here also only essential facts are recorded; but as an aid to accuracy and methodical description it is well to have a list of references written or printed on card-board including in regular order all the details of an exhaustive examination. This can be glanced over at the time of making the record.

Preparation of the Patient.—As a preliminary to all examinations, it is necessary that the bladder and bowels be empty. For this latter an efficient cathartic should be administered the night before. A full bladder or loaded rectum increases reflex excitability and adds materially to the difficulties of an examination. A loaded rectum, by encroaching on the pelvic space, offers mechanical obstacles to vaginal manipulation and renders rectal exploration well-nigh impossible. At home the patient should be clad in a night-dress or loose wrapper; but at the office this is seldom practicable. She should, however, on all occasions be as simply and as loosely clad as possible. Tight-fitting and superabundant clothing are effectual bars to a satisfactory examination. All constriction should be removed from the waist, so as to allow perfect freedom of the respiratory movements and natural adjustment of the various organs. The waist-bands should be unfastened; the corset and corset-cover removed; and, in fact, every close-fitting garment from surface to skin should be unbuttoned, unhooked, or untied. It is also better that the drawers be removed; and, if closed, this becomes imperative. It will not do to slip them down to or below the knees, as this binds the legs together. Women will often insist that their clothing is loose, or will merely "let them out" here and there; but firm insistence on the part of the physician will usually enforce compliance, and she will esteem him all the more for it. As a hint to beginners, I will say that nothing serves to allay the embarrassment of both patient and physician so effectually as scrupulous and minute attention to the details preliminary to examination. It carries with it a business air that assures and pleases the patient.

Methods of Examination.—In making gynecologic examinations we employ sight, touch, hearing, and occasionally the sense of smell. It is seldom that one of these methods is relied upon to the exclusion of others. As a rule, two or more of them are combined. Instru-

ments are frequently used as accessories when the part to be examined is not accessible to the unaided senses. The sense of smell plays a very unimportant rôle in gynecologic examinations, but is sometimes suggestive, as in the case of advanced cancer and in certain septic conditions of the genital tract. In speaking of the various methods of examination, all that can be done in this connection is to cite a few illustrative applications to a general principle.

Examination of the Abdomen.—The abdomen is examined by inspection, palpation, percussion, and auscultation.

Inspection.—The woman clad in her ordinary night-attire is placed on her back in bed or on a table and the abdomen exposed. Motives of delicacy will dictate that all parts of her person not necessary to a thorough examination should be covered. A glance at the abdomen will apprise us of the surface indications. Linæ albicantes tell the story of a pre-existing abdominal distension, usually, but not necessarily, from pregnancy. They may arise from any form of pronounced and prolonged abdominal distension. Large veins indicate interference with the venous circulation, and are often associated with intra-abdominal growth. They are especially significant of malignant growth.

The size and contour of the abdomen are to be considered. A symmetrical enlargement may be due to tympany, a deposit of fat in the abdominal walls, ascites, or cystic or solid growth. To the practiced eye there is a difference in the appearance of the fatty and tympanitic abdomen. An ascitic abdomen is somewhat flattened at the top and bulges laterally, while an abdomen containing a cyst or solid growth is more mound-shaped. A small abdominal growth may be situated eccentrically: may lie to one or the other side of the median line or in the upper or lower zone of the abdominal region. Some abdominal growths or encysted fluid accumulations are irregular in outline. In these the abdomen is asymmetrical in appearance. The thickness and firmness of the abdominal walls and the mobility or fixedness of the growth have much to do with the surface indications.

Palpation of the abdomen is more instructive than inspection. The patient should lie on her back, with the limbs partially flexed and the abdomen bared. Palpation may sometimes be conducted under cover, but this does not allow of that freedom of manipulation that insures the best results. The finger-nails should be trimmed close, the hands well warmed, and the manipulations begun in the gentlest manner. Cold hands or abrupt digging into the abdominal walls are apt to frighten the patient and lead to willful or reflex hard-

ening of the walls. By gently passing the hands over the surface of the abdomen, followed by gradually increasing pressure and massage, the patient's fears are allayed and reflex muscular contractions obviated. Sometimes by engaging the patient in conversation her thoughts may be diverted from herself with happy effect. It is sometimes necessary to instruct the patient to relax the abdominal muscles and to breathe regularly. "Let yourself go and don't hold your breath" are injunctions frequently used. It may be necessary to anesthetize the patient. In difficult cases deep palpation may sometimes be accomplished by depressing the walls simultaneously with the expiratory movement, maintaining the pressure during inspiration, going deeper at the next expiration, and so on until the object is attained.

Both hands should be used, and, if a tumor or other mass be found, the hands should be placed over it palm to palm, the ulnar edges resting over the center or most prominent part of it and then separated, hugging the tumor all the while until they have reached opposite sides of it. In this way its location, size, and general contour can be made out, and, by a rocking movement, its mobility or fixedness. The effect of the respiratory movements on the growth is sometimes of diagnostic value. All intra-abdominal growths of moderate size, when not fixed by adhesion, ascend and descend with the movements of the diaphragm in respiration. On the other hand, a tumor of the kidney is not thus affected, because it is not in the peritoneal cavity and is not subject to intra-abdominal influences. The range of mobility and the direction of the same are of like import. A movable kidney will swing through a larger arc and will approach nearer to the median line than a distended gall-bladder. Pelvic tumors when movable describe an arc about the pelvis.

Percussion.—Cystic tumors and accumulations of fluid in the abdominal cavity may be recognized by the fluctuation-wave communicated to them by percussion. By placing a hand on one side of the abdomen and with the fingers of the other tapping lightly the opposite side, a wave of fluctuation will be felt. Sometimes, and especially in fat women, this maneuver will elicit a thrill that is hard to distinguish from the true fluctuation-wave. This is easily eliminated by making an artificial diaphragm in the abdominal wall between the percussing and palpating hand. This is usually done by an assistant, who applies the ulnar edge of his hand along the middle line of the abdomen and makes firm pressure. This in no way interferes with the impulse-wave of fluids within the cavity. It is well to

remember that the fat-wave will not cross the umbilicus, and in the absence of assistance a very satisfactory and reliable examination can be made by keeping the umbilicus between the two hands while percussion is made from different points.

It is sometimes necessary to shift the position of the patient in order to relax certain sets of muscles, or to bring the part sought for within easy reach. Thus, for examination of a movable kidney, the patient is placed on the side opposite to the kidney to be examined, with her body slightly bent forward and the limbs flexed. Percussion is a very valuable aid to diagnosis. In ascites, when the fluid is free in the abdominal cavity it always gravitates to the lowest point according to the position of the patient. Likewise the intestines when not bound down, being light and filled with gases, will float to the surface and occupy the highest level. If the patient lie on her back the crest of the abdomen will yield a tympanitic resonance on percussion, while the flanks will be dull. If she lay on one side or the other, or assume the sitting or standing posture, it will always be found that the fluid is below and the gases uppermost, as indicated by the percussion-note. An ovarian cyst, a solid tumor, or an encysted fluid accumulation will yield the same percussion-note in all positions; that is, it will be dull over the mass and resonant at the sides. In the diagnosis of abdominal growths percussion is often of more value than inspection or palpation.

Auscultation of the abdomen may be practiced by the ear directly or through the medium of the stethoscope. Considerations of delicacy should not prevent us from making use of that method that will give the best results. The patient should lie on her back within easy reach, and the examiner should have a comfortable position so as not to interfere with his breathing or circulation. It is often necessary to determine the presence or absence of pregnancy or the life or death of the fetus *in utero*. By auscultation we can detect the fetal heart-sounds and the uterine and placental sounds incidental to pregnancy. We can also detect the purring of hydatids and the friction-sounds of the peritoneum. In obstruction of the bowels the borborygma of violent peristalsis is a valuable aid to diagnosis, while, on the other hand, an absence of the peristaltic sound would indicate intestinal paralysis.

Examination of the External Genitals and Pelvic Structures.—These examinations, when practicable, should always be made on a table. The table should be provided with stirrups or a foot-rest, so that the patient's hips may be brought well down to the end without

cramping the limbs. There are many elegant tables and gynecologic chairs on the market, and the differences between them are not so marked nor so essential as to call for special distinction. As between tables and chairs, it may be said that the table alone is adapted to the operating-room. For office use the chair is a little more elegant, takes up less room, and answers the purpose of ordinary practice. The patient—prepared, as indicated above—takes her position on the

Fig. 1.—Universal Chair-table.

table, her feet are placed in the stirrups, a cover thrown over her, and the clothing drawn up so as not to interfere with the necessary manipulations and observations.

Inspection of the External Genitals.—The cover may now be thrown back over the knees, or depressed between the thighs and the examination made through a slit. Many patients will resent unnecessary exposure, and this part of the examination should be made

with as little exposure as is compatible with thoroughness. The inspection should not only include the external genitals, but also all contiguous parts. Thus, the anus, perineum, fourchette, labia majora, nymphæ, vestibule, clitoris, hymen or its remains, urethra, and even the orifices of the small ducts of the vulvo-vaginal glands should be inspected successively and critically. For your own protection sores and discharges should be closely examined, to guard against syphilitic infection. This has happened repeatedly to physicians, and offers a strong reason for inspecting the external genitals before resorting to digital examination. If deemed advisable, the lower segment of the anterior wall of the rectum can be brought to light by everting it from the vaginal side. A finger is introduced into the vagina, palmar aspect backward, and by a circular sweep carries the tissues toward and through the anal outlet. In women of firm fiber this is often very painful. In others it is quite devoid of pain and easy of accomplishment.

Digital Examination.—After careful inspection of the superficial parts the examination is continued by the sense of touch. This, which is known as the digital examination, is made by the index finger of the right or left hand. The left hand is preferable for examinations of the left side, and *vice versa*. The beginner should practice with both so as to become ambidextrous. For deep touch, and in some other conditions, two fingers are used to better advantage than one. The finger—well lubricated with vaselin, soap, or some other bland lubricant—is carried up to the vaginal vault and careful note made of all essential features along its route. The firmness or laxity of the canal, the temperature, the dryness or moisture, the presence of morbid growths, cicatricial bands, etc., should all be taken into account. Then the cervix should be investigated as to its position, size, shape, consistence, smoothness or irregularity, and the condition of the os.

Rectal Indagation.—In virgins with intact hymen, and under some other conditions, it is desirable to conduct the digital examination by the rectum. (Fig. 2.) By this route much valuable information may be obtained as to the position and general condition of the pelvic contents. Properly conducted under favoring conditions, it is occasionally more satisfactory than the vaginal examination. Especially is this the case in relation to the contents of the posterior segment of the pelvic circle. In the normal position of the uterus the cervix is within easy reach, and in case of retroversion the fundus and uterine appendages are more accessible than in vaginal indagation.

For more thorough examination of the uterus and its adnexa, the cervix should be seized by a tenaculum or bullet forceps and drawn down. This gives little or no pain, as the cervix is comparatively insensitive. By the aid of this maneuver the uterus and appendages are brought within easy reach of the examining finger, and can be palpated both behind and in front. The advantages of this

Fig. 2.—Bimanual Examination with Finger in the Rectum.

method of examining the pelvic organs are not sufficiently understood.

Bimanual Examination.—Having explored the vaginal canal, the finger unaided has reached its legitimate boundary. For further information concerning the pelvic viscera it is necessary to resort to bimanual examination. In this both hands are used, one being placed on the abdomen just above the pelvic brim and one or more fingers of the other hand in the vagina. The object is to bring the pelvic

structures, one after another, between these two hands, in order to determine their physical condition by the sense of touch. If the uterus be in normal position, a finger placed on the cervix while the outside hand presses downward just above the symphysis pubis will bring the organ between them. It will be recognized as a more or less resistant body, and the cervix is felt to move distinctly when

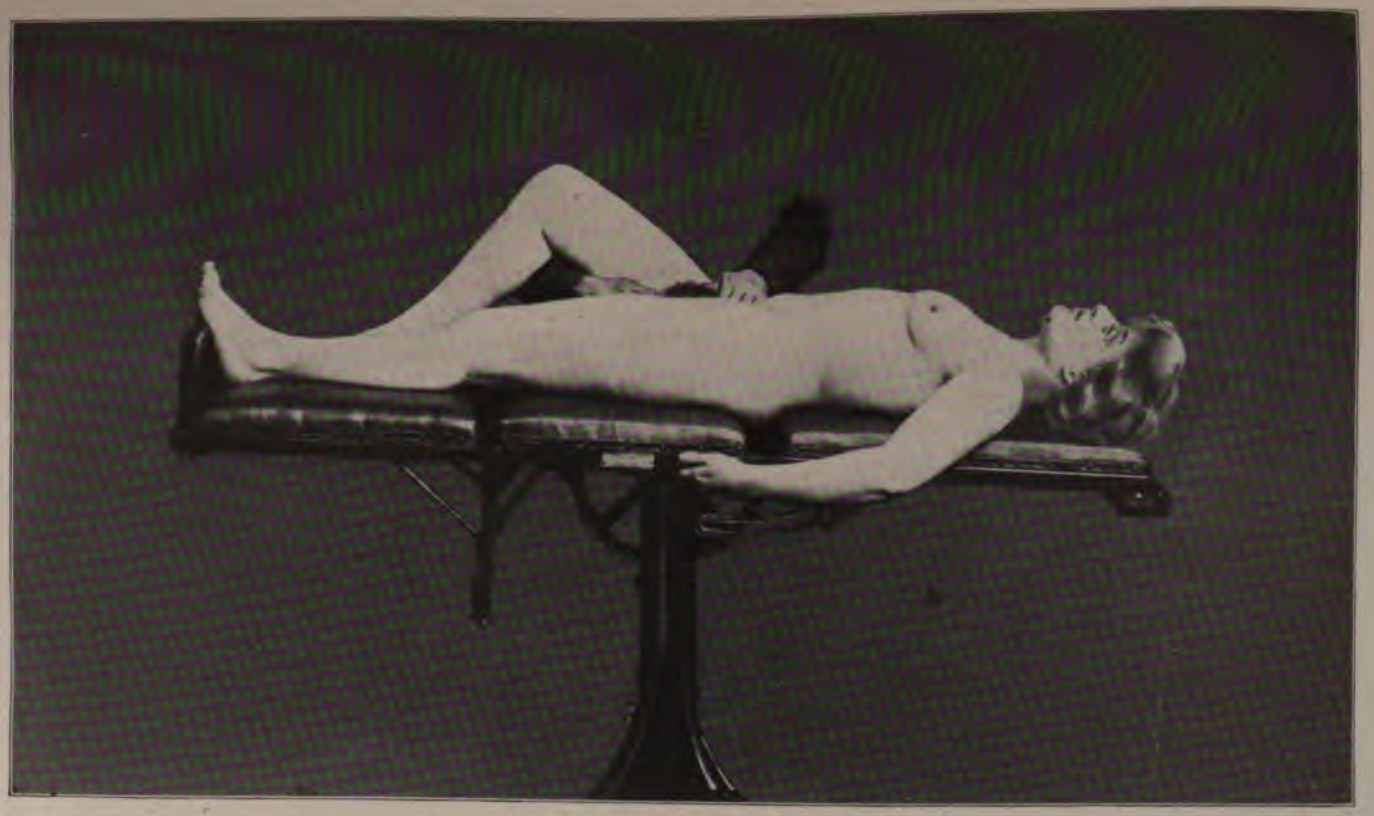
Fig. 3.—Bimanual Examination.

impulses are communicated to it through the body of the organ by the outside hand. (Fig. 3.) To depress the abdominal walls the ulnar aspect and tips of the fingers should be used. The uterus, having been located, should be explored systematically. The vaginal finger is drawn forward and upward so as to rest on the anterior surface of the body of the uterus. Now, by the conjoint action of the fingers on the anterior and posterior surfaces, the organ is gone over in detail, and its size, shape, and consistence determined.

There are several ways of employing the sense of touch in examining the pelvic organs, each of which has its advantages under varying conditions. One is to place the fingers of the outside hand directly over the part to be examined, and without moving the fingers glide the intervening tissues over it. Another is to hold the fingers passive while the organ is moved about under them. A third is to steady the organ with the vaginal fingers while the outside fingers are moved about over the surface to be examined, all the while keeping in touch with it by a series of light pressures. For examination from the vaginal side a reversal of the same tactics may be employed. Of these three methods, the first is generally practiced, and it is, on the whole, the most satisfactory, for the reason that the fingers never leave the surface under examination, and can take note of slighter variations in contour than by the last. (Plate I.)

Should the uterus be retroverted, it will be necessary to restore it to the normal position before a satisfactory bimanual examination can be made *per vaginam*. Here, however, a bimanual rectal exploration can usually be made without difficulty. The ovary, when in position, can usually be found by placing one or two fingers in the right or left lateral vaginal fornix, as far out as possible, and depressing the abdominal wall over them so that the fingers of one hand can be felt by those of the other through the intervening tissues. Now, by drawing them downward and toward the uterus the first intimation of the presence of the ovary will be its slipping from between them. Once located, it can easily be found again and palpated. The Fallopian tubes, round and ovarian ligaments in their normal state, and because of their softness and pliability, are difficult to distinguish except by experts and under favoring conditions. Recognition of these structures in their normal condition is more a test of tactile skill than of any real practical value. The ureter can be found by gliding the finger forward and outward from the cervix. It will be distinguished as a rather well defined cord running parallel with the pelvic brim and forming the dividing line between the soft and pliable structures around the uterus and the firmer ones at the periphery of the pelvic space. When inflamed it is much more easily found than in the normal condition. In pathologic conditions all the pelvic structures, with but few exceptions, become firmer, larger, and much more easy of detection. Diseased ovaries and tubes settle in the pelvis, and are more easily reached by the vaginal finger.

PLATE I.



Bimanual Examination from the Side.

CHAPTER III.

GYNECOLOGIC EXAMINATION (INSTRUMENTAL) AND POSTURE.

EXAMINATION BY THE AID OF INSTRUMENTS.

The Uterine Sound.—The uterine sounds most commonly in use are those of Simpson and Sims. They are about twelve inches long and from one-twelfth to one-eighth of an inch in thickness. They are slightly bulbous at one end and enlarged and flattened at the other. This latter serves as a handle. They are usually made of copper, plated, and should be of one piece. Formerly the handle

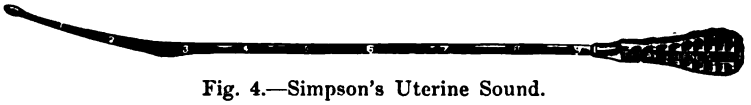


Fig. 4.—Simpson's Uterine Sound.

was of hard rubber and corrugated, but since the days of asepsis this, very properly, has been superseded by the metal handle. The Simpson sound is provided with a little hump two and one-half inches from the end, to indicate the normal depth of the uterine canal. The Sims sound is more flexible than that of Simpson. The Jenks spiral sound is very flexible, and is sometimes useful in following the

Fig. 5.—Sims's Uterine Sound.

sinuosities of a crooked canal; but, aside from determining the depth of the canal, such sounds are of little utility. Uterine probes are more delicate than sounds, and are seldom called for.

Use of the Sound.—The position of the uterus and the direction of the canal should be determined, at least approximately, before any attempt is made to use the sound. The sound should be curved to correspond to the direction of the canal, taking into consideration the relative positions of the uterus and vagina. In the normal

uterus in its normal position the distal three inches of the sound should be curved to represent the eighth part of a circle, or, in other words, the point should form an angle of forty-five degrees to the stem of the instrument. After locating the os, drop the tip of the finger back a little so that its palmar surface will be on a line with the entrance to the canal. Guided by this the sound is made to enter the cervical canal, and by depressing the handle the sound glides up the canal to the fundus. Sometimes the point of the instrument will become engaged in the folds of the cervical canal or be arrested at the internal os. This must be overcome by delicate manipulation, by elevating or depressing the handle, by rotating it from side to side, or by bringing the cervix forward with the finger in the vagina. Under no circumstances is force to be used. Sometimes, especially in acute anteflexion of the uterus, by bending the sound at the handle end in a direction opposite to that of the distal curve, introduction will be facilitated. When the cervix is bent forward, forming an acute angle with the body, by entering the sound with its

Fig. 6.—Uterine Sound with Gauge.

concavity backward, and then, when it becomes arrested, rotating it so as to bring the concavity forward, it will often pass the obstacle and enter the uterine cavity. Finally, in intractable cases the uterine canal may be straightened by seizing the cervix with a tenaculum or bullet forceps and drawing it down. The sound may be used with or without the speculum. Most experienced gynecologists prefer to use it without, as it gives a greater latitude of motion.

The sound acquaints us with the length of the uterine canal and its direction and patulousness. Conjoined with abdominal palpation it enables us to determine the degree of mobility of the uterus and its connection with other structures. In practice the sound is frequently employed to replace the retroverted uterus. The sound is by no means a harmless instrument. Its unskillful use has often led to serious or even fatal results. Traumatism of the endometrium and perforation of the uterine walls are of common occurrence. Septic matter may be carried up from the cervical canal or vagina. The sound should not be used without a preliminary cleansing of these

parts and a sterilization of the instrument. This latter can be quickly and effectually accomplished by passing it through a flame. Under aseptic conditions the perforation of the uterine wall by the sound is almost never followed by evil consequences. The more experienced one becomes in bimanual examination, the less use he has for a sound. Still, it is a very useful instrument, and at times indispensable.

The Speculum.—The speculum for diagnostic purposes has a very limited field. As a means of diagnosis it does not compare in any sense with the bimanual examination. It is, nevertheless, held in high esteem by the fledglings of the profession, while to the laity it is the *sine qua non*. With them "seeing is knowing," and they cannot be made to understand how an examination can be conducted

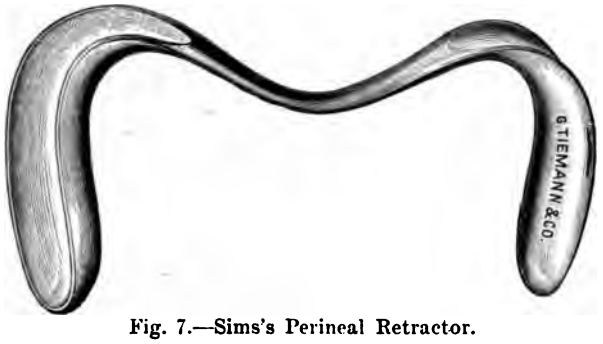


Fig. 7.—Sims's Perineal Retractor.

without the speculum. About all that can be made out by the speculum that cannot be done better by other means is the color of the parts and some of the finer lesions of the vagina and cervix, such as are produced by exfoliations of the epithelium. Cylindrical specula have gone out of date. There are two kinds of specula in general use; the bivalve and the perineal retractor. The perineal retractor, as its name indicates, is an instrument to lift up or retract the perineum, and with it the posterior vaginal wall. The Sims perineal retractor, which is the original and type of all perineal retractors, consists of a shaft and two blades: one large and one small. The blades are at opposite ends of the instrument, and are set at right angles to the shaft. They are concave on one side and convex on the other, being fashioned to conform to the shape of the vaginal canal

and so as not to inflict pain either in introduction or in the subsequent retraction of the perineum.

The patient should be on her left side in the Sims position, to be described directly. To introduce the retractor, the labia should be separated by the fingers of the left hand, and the blade inserted with its convex surface toward the perineum. In pushing it home the distal end of the blade should be made to follow the curve of the sacrum so that it will come up behind the cervix. The retractor is now drawn forcibly upward and backward so as to retract the perineum. There is an art in holding the retractor to avoid fatigue and consequent unsteadiness. The untrained assistant is apt to grasp the outside blade and stand aloof from the patient. As a consequence he soon tires, and a rocking motion is communicated to the speculum. Sometimes it slips from the vagina. He should take his position alongside the patient, his left forearm resting on her hip. He should seize the shaft of the retractor with his right hand, the thumb looking upward and resting on the under surface of the outer blade. He

Fig. 8.—Sims's Depressor.

should now bring his elbow to his side, which affords him steady support. The left hand can be used to hold up the nates and retract the soft tissues from the vulvo-vaginal outlet. When the patient is in the proper position, and the retractor is used, the air rushes in and inflates the vagina and affords an excellent view of the vaginal wall and cervix.

The Sims position is the most favorable for the use of the perineal retractor. Even with the patient in the dorsal decubitus a very good view of the lower portion of the anterior vaginal wall can be obtained and the cervix exposed. In this position, however, the anterior wall falls in from above, and partially, if not entirely, obstructs a view of the deeper structures. To overcome this, an instrument known as the depressor is used to lift them out of the way. This form of speculum is most satisfactory when properly used, and is the only one through which operations on the vagina, or the deeper structures through the vagina, can be performed. For operative purposes, and especially for operations on the uterus and for transvaginal operations on the pelvic viscera, the blades of the retractor are made

flat and in most instances much shorter than those of the Sims. The shorter blade admits of digital manipulations beyond their extremities, the parts being brought within reach of the finger by traction forceps. Retractors are sometimes placed on the sides and front as well as the posterior wall of the vagina.

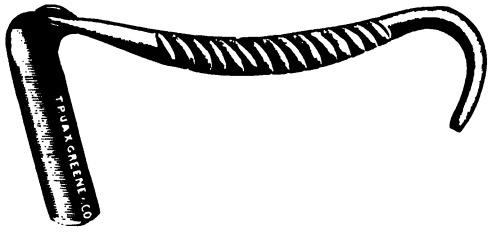


Fig. 9.—Jackson's Perineal Retractor.

For bringing down the uterus traction forceps with strong flat jaws and short, flattened teeth should be used. The old-fashioned volsellum, with its long, sharp prongs,—and, for that matter, the bullet forceps also,—are objectionable in that they inflict a puncture wound and easily tear out. Traction forceps of the kind mentioned above seldom bring blood, and are so strong and take such firm hold

Fig. 10.—Collins's Traction Forceps.

on the tissues that almost any necessary degree of force may be used to bring the uterus down.

The principal drawback to the use of the perineal retractor is that it requires the help of an assistant. This has, to an extent, been obviated by devices whereby the speculum is made self-retaining. Such devices are, for the most part, troublesome, and not altogether satisfactory. For the dorsal position some excellent self-retaining retractors have been devised, but, as they are more or less painful, they are not

often resorted to without an anesthetic. The author's self-retaining perineal retractor, shown in the accompanying cut, gives an excellent exposure of the anterior vaginal wall and cervix, and affords excellent facilities for operations on the same. As it is provided with a ratchet,

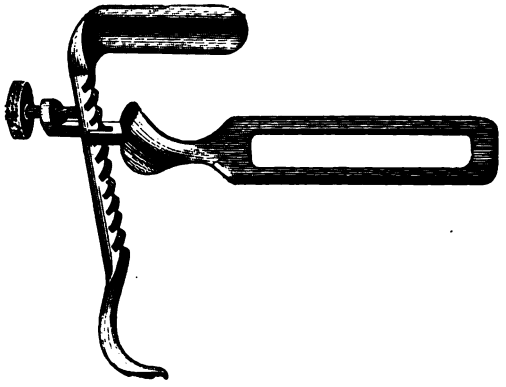


Fig. 11.—Author's Self-retaining Perineal Retractor.

any amount of perineal traction that is necessary or desirable can be secured by it. The weighted retractors are very convenient, but will not always overcome the resistance of a rigid perineum, and are liable to slip out, especially in the case of a lacerated perineum.

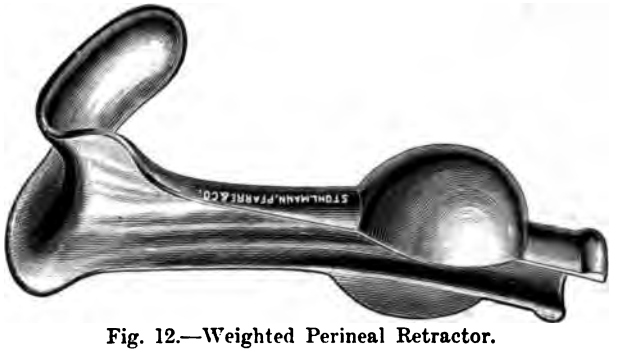


Fig. 12.—Weighted Perineal Retractor.

For ordinary office practice and the medical treatment of the vagina and cervix the bivalve speculum is much more generally used than the perineal retractor. This is because of the ease and facility with which it can be used without the aid of an assistant. The modifications of this speculum are too numerous to mention. To my mind there is none that possesses so many points of excellence as that of

Brewer. The blades resemble the duck-bill in general contour, and are flat and narrow where they impinge on the delicate and sensitive structures at the vaginal outlet. As this is the narrowest portion of the canal a very considerable divergence of the blades at the distal

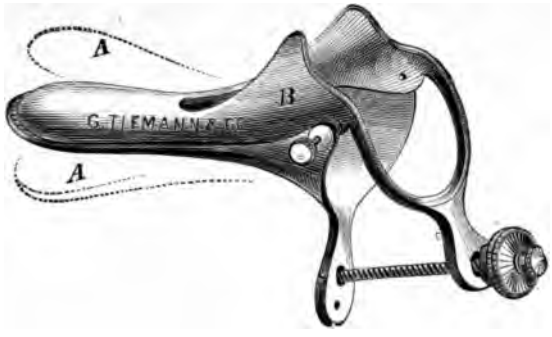


Fig. 13.—Brewer's Bivalve Speculum.

end can be secured without making undue pressure on these sensitive surfaces. There is also a deep notch in the upper blade to accommodate the urethra, and which affords greater freedom in the use of the sound. The instrument is so constructed as to be adapted equally

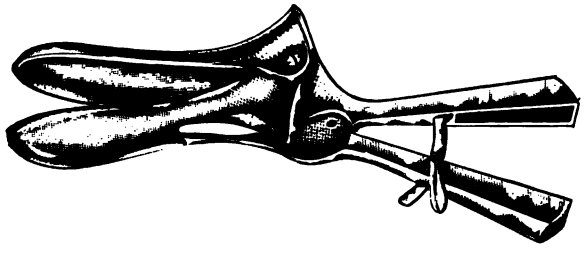


Fig. 14.—Author's Aseptic Vaginal Speculum.

to the virgin and the matron, thus obviating the necessity of keeping on hand specula of different sizes. For purposes of cleanliness the author has devised a speculum modeled after the Brewer, but so constructed as to admit of its being taken apart instantaneously for

cleaning. It consists of three pieces, and works with a ratchet instead of screws. To take it apart all that is necessary is to separate the blades widely and lift them apart. It answers every purpose, and, as there are no screws to work loose, it never becomes rickety.

To Introduce the Bivalve Speculum.—The speculum is taken in the right hand with the index finger extended along, and projecting beyond, the posterior blade. The instrument is tilted to one side, so that the upper lateral edge will pass to the right of the urethra. The labia are separated by the fingers of the left hand, and the end of the speculum, guided by the tip of the right index finger, engaged in the opening. As it passes up the canal it is rotated so as to bring the blades into proper position, and at the same time given a direction downward and backward so as to bring the longer posterior blade up behind the cervix. The blades are now opened and the cervix will be found between them occupying the center of the field. Should the attempt be unsuccessful, it is better to withdraw the instrument entirely, as it is difficult to change the relative position with the speculum in the vagina. In subsequent attempts it will generally be found necessary to give the speculum a more decided backward inclination. In abnormal positions of the cervix (the position of the cervix should always be ascertained by preliminary digital examination) the direction of the speculum should be changed to correspond. Occasionally the cervix will have to be drawn into the field by the tenaculum. In practice the bivalve speculum is serviceable in making applications to the cervix, vagina, and uterine canal, and in placing tampons. Cervical cysts may be punctured through and cervical polypi may be snipped off, but not with the same facility as with the perineal retractor.

Fig. 15.—Pratt's Rectal Dilator in Graduated Sizes.

Dilatation of the Genital Tract for Examination.—In virgins a close and resistant hymen will often interfere seriously with digital and specular examination. This can usually be overcome by a little prudence and patience. As the parts about the hymen are very sensitive, it is necessary to get the confidence and co-operation of the patient before proceeding. Assure her that what you are about to

PLATE II.

Dorsal Position.

do will be painful, but in no sense injurious, and that if she will help you the object can be accomplished much more quickly and easily than if she resists. Tell her, furthermore, that, when the finger is once well in, the pain will cease. I see no need, in the majority of cases, in commencing with anything smaller than the index finger. This should be well lubricated and the tip of it laid gently against the

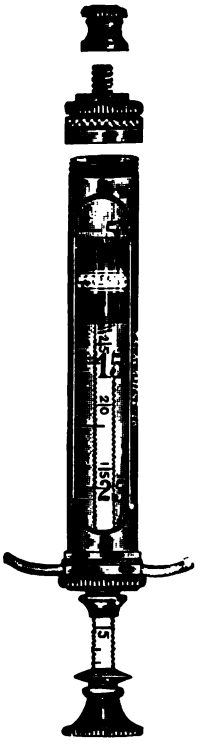


Fig. 16.—Hypodermic Syringe for Examination.

Fig. 17.

hymen and allowed to remain there for a few minutes. This will, in a measure, allay the fears of the patient and obtund the sensibility of the parts. Then insinuate gently through the opening and by easy stages up into the canal, pausing at intervals if the pain should be severe, but never withdrawing. In passing the first and second joints if you can induce the patient to push downward against your finger it will not only facilitate the introduction, but, by making her an

active participant, increase her tolerance. When the finger is well in, hold it quiet and press firmly with the outer knuckle against the pubic bone. Several *séances* of this kind, repeated at intervals of two or three days and each time increasing the dilatation by judicious pressure in different directions, will enable you to use the speculum or make satisfactory digital exploration. In cases of extraordinary sensitiveness I have derived great benefit from the use of the Sims glass plug, or, better still, Pratt's graduated metal rectal dilators. In many cases the vagina need not be invaded, a digital examination by the rectum being all sufficient, and thereby saving to the patient that most precious ensign of virginity: the hymen.

Dilatation of the uterine canal for the purpose of examination should not, as a rule, be undertaken without an anesthetic. Whenever practicable any operative procedure that may be found necessary should be done at the same time. The use of anesthetics for examination should not be resorted to too often, for most patients conceive such an abhorrence for them after one experience as to deter them from submitting to necessary operative interference at a subsequent period. In women with a fairly patulous canal shavings from the endometrium may be taken by the exploratory curette without anesthesia. A very gradual dilatation of the urethra for explorative purposes may also not infrequently be obtained without excessive pain. The use of cocaine as a local anesthetic will mitigate the suffering of a urethral dilatation, but should be used with circumspection, as disaster has attended its use. The hypodermic needle is sometimes useful for withdrawing the contents of cysts and abscess-cavities for examination. It should always be used under aseptic precautions, and pulsating vessels should be avoided. The old-fashioned exploring needle with a groove along one side of it should never be used, for, if a septic cavity is tapped, it distributes the poison along the track of the needle.

POSTURE.

The position of the patient may be changed according to special indications, both for examination and treatment. The positions most frequently used are the dorsal, left lateral (or Sims), the knee-chest, the erect, and the Trendelenburg.

Dorsal Position.—In the dorsal position the patient lies upon her back, the buttocks to the light, with the legs flexed and separated. If a modern table be used, the patient's feet are placed in stirrups and the buttocks brought down flush with the end of the

PLATE III.

Left Lateral, or Sims, Position.

table. (Plate II.) The stirrups should neither be so far apart nor so close to the table as to place the patient in a constrained position, while at the same time they should offer space for the necessary observation and manipulations of the physician. This is the position in which most of the ordinary examinations are made.

The Left Lateral, or Sims, Position was at one time much in favor in this country, but has of late years been largely supplanted by the dorsal. In this the patient is placed on her left side with the hips at the left lower angle of the table, left arm thrown back, and the legs acutely flexed on the body. The right leg is more sharply flexed than the left, and is partially crossed over, so that the right knee almost touches the table. The right, or upper, trochanter should be several inches in advance of the left, or lower, trochanter, and the left breast should rest upon the table. (Plate III.) The position is, in reality, not strictly lateral, but intermediate between lateral and prone. As the object of the position is to cause the abdominal contents to fall away from the pelvis, it is essential that every detail of the directions here given should be complied with in order to secure the desired effect. Anything short of this will be disappointing. It is usually necessary, after the patient has assumed the position according to instructions, to place one hand under the left hip and another over the right, and, by a combined movement of drawing on the lower hip and pushing on the upper, rotate the patient forward, so that the left trochanter is thrown in advance of the right. When the position is correctly assumed and the Sims speculum introduced, the anterior vaginal wall falls away, the air rushes in and distends the vagina, and the cervix uteri is brought into plain view.

The Knee-Chest Position is sometimes serviceable in manipulations on the retroposed uterus, and in examinations of the anterior vaginal wall. In this the patient drops on her knees and inclines the body forward until the breasts rest upon the table, the head being turned to one side and the arms extended above the head or pinioned to her side. (Plate IV.) She must not sink on her haunches, but must keep the thighs perpendicular.

The Erect, or Standing, Position is occasionally useful in determining the amount of descent of a prolapsed uterus or vagina, the adaptability of a pessary, or other conditions in which gravity is an important factor in the case. The patient stands against the wall with the legs separated, or better still with one foot on a stool, and the physician drops on one knee before her, in which relative positions the examination is conducted.

The Trendelenburg Position is useful when it is desirable or necessary to relieve the pelvis and lower abdominal regions of the pressure and presence of the intestines. This is of service in determining the relations of morbid growths to the pelvic structures, but its chief utility is found in examinations and operations on the pelvic viscera after the abdomen is opened. The patient is placed on an incline with the head downward, and as a result the abdominal viscera gravitate to the upper abdominal zone, leaving a clear field for work and observation in the lower abdomen and pelvis.

PLATE IV.

Knee-chest Position.

CHAPTER IV.

GYNECOLOGIC TECHNIQUE.

GYNECOLOGIC technique is the manner or method in which gynecologic operations are performed, and embraces all the practical details of such work. It includes both preparation and after-treatment. The last quarter of a century has been prolific in technical changes, many of which have been distinct advances. The hemostatic com-

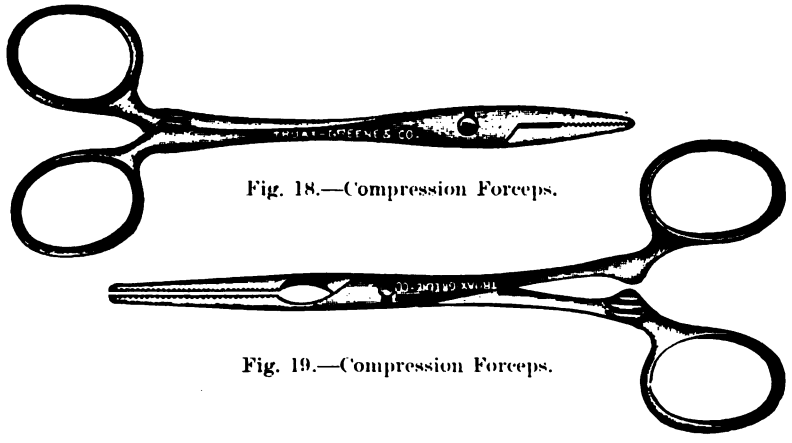


Fig. 18.—Compression Forceps.

Fig. 19.—Compression Forceps.

pression forceps enables the operator to work with more speed and certainty, and oftentimes converts a bloody into a bloodless operation. Ligating the uterine arteries instead of the stump in supravaginal hysterectomy has transferred that operation from the domain of deadly danger to that of safety and feasibility. Shelling out the intraligamentous cyst from below upward, as opposed to stripping the ligament downward, is a life-saving change. But of all the improvements of technique for this or any other age, that of cleanliness takes foremost rank. Cleanliness has become the basic principle of modern surgery and the capstone of technical triumph. It matters not how brilliant, how skillful, how deft, or how swift the modern surgeon may be, if he has not cleanliness, he is as of sounding brass and tinkling cymbal. His blade cannot be so swift, nor his fingers so deft, but the germ will follow them, and once implanted will work out its baleful purpose. The clean-cut tissues besmeared with germs soon become ragged, sloughing caverns. But the day for discussing

the merits—the absolute necessity of cleanliness in surgery—has passed, and the burden of effort is to inculcate and enforce the practical application of an established principle.

GERMS AND GERM INFECTION.

The germ is a vegetable growth. The frequent allusions to it as a bug or animal parasite are purely fanciful and intended to be funny. The pathogenic germs that more especially concern us as gynecologists are five in number. They are the streptococcus pyogenes, staphylococcus pyogenes aureus, staphylococcus pyogenes albus, bacillus coli communis, and the gonococcus Neisseri. Most of these find their natural habitat in the vagina and cervical canal. The first is the most virulent, and is the underlying factor in the graver forms of puerperal infection. The third, or staphylococcus albus, gives rise to stitch hole abscess and was formerly considered as a skin germ. It is now known to be much more widely distributed, and to play an important rôle in preventing the spread of peritoneal infection by exciting adhesive inflammation in the parts contiguous to the infected area and thus circumscribing it. The fourth is a resident of the intestinal canal, but sometimes invades the peritoneal cavity as a result of lesion of the bowel. The gonococcus is the specific germ of gonorrhea. It is frequently associated with the staphylococcus aureus in tubal abscess.

Sepsis, asepsis, and antisepsis are terms that are very much in vogue. In a loose way sepsis means the presence of germs; asepsis, the absence of germs; and antisepsis, against or antagonistic to germs. Strictly speaking, sepsis is the *result* of germ infection. Germs luxuriate in filth and dead tissues. They are the essential agents in decomposition and putrefaction. Live, healthy tissues are antagonistic to germs. Young cells, especially leucocytes, battle with and destroy germs. Hence they are called germ-killers, or phagocytes. Certain agencies called opsonins are found in normal blood of man and various animals. These opsonins prepare bacteria so that they are susceptible to phagocytosis. The serum of normal blood in man contains opsonins for various bacilli. Wright has demonstrated that of the two, the opsonins are of more value than the leucocytes, as the latter are dependant upon the former for their efficiency. The leucocytes must be acted upon by the opsonins before they are able to digest or neutralize the bacteria. Cleanliness is the only safeguard against germs. They cannot exist in the presence of cleanliness, but find their natural element in filth and dead tissues. Hence, unclean parts are the harborers of germs.

Anything that weakens or diminishes the vitality of tissues, or produces cell-necrosis, however slight, favors germ growths and germ infection. Septic, or germ, infection, is the surgeon's greatest enemy. It kills his patients and undoes his best efforts. In plastic surgery it prevents union, or at best allows of union by granulation, which often defeats the object of the operation. Suppuration always indicates germ infection. Asepsis is the surgeon's ideal,—the aim and end of his endeavors,—and cleanliness is asepsis. Asepsis is attained by dislodging the germs or by killing them. Soap and water and a vigorous use of the brush usually suffice for hand and body cleaning. Germs may be destroyed by heat or chemicals. Boiling water or steam are the forms of heat most frequently employed. Dry heat at the temperature of boiling water is also efficient. Metal instruments are more easily sterilized than woven fabrics. An immersion in boiling water for five minutes usually suffices. Articles of clothing, sponges, dressings, and ligatures are subjected to a germ-killing heat for thirty minutes three days in succession. This repetition is necessitated by the spores, which are not affected by the heat. Some hours are therefore given them to develop into germs, and as germs they are easily destroyed. Antiseptic chemicals are much less used than formerly, their use being confined principally to such articles as cannot be conveniently sterilized by heat or washing. They are sometimes used as adjuncts to other methods. It is not the germ itself which produces sepsis, but its product or secretion. Some chemicals, such as iodoform, have the power to neutralize this product, while they have no germicidal properties.

PREPARATION FOR OPERATION.

The amount and character of the preparation will depend largely on the kind of operation in contemplation. For abdominal work the most scrupulous care and attention should be given to every detail. This includes the preparation of the room and its appurtenances, the instruments and appliances, the operator and his assistants, and the patient.

The Room.—The room should be prepared by removing carpets, draperies, and all upholstered furniture. It is safer to remove the paper from the walls. The wood-work should be washed with soap and water and wet with a 1 to 1000 mercuric bichlorid solution, which should also be applied to the walls. Benches, tables, and chairs should be treated in like manner. Basins and vessels of all kinds

should be cleansed and scalded. The water used in the operation should be boiled, turned into sterilized vessels, and covered with sterilized towels. There should be an abundance of it, both hot and cold.

Fig. 20.—Boeckmann's Sterilizer.

Instruments.—Metal instruments may be sterilized by fifteen minutes' exposure to steam heat or five minutes to boiling water. The addition of a little soda—1 per cent.—to the water prevents rusting. Sharp instruments, such as knives, are dulled by heat, and may usually be made sufficiently clean by scrubbing with green soap.

Fig. 21.—Boeckmann's Sterilizer (Chamber for Dressings).

Gauze Sponges, Dressings, Ligature, and Suture Material.—These are sterilized by steam or boiling water. They should be exposed to a boiling heat for thirty minutes at a time for three days in succession. Articles to be sterilized should be inclosed in towels or other convenient wrapper, each kind by itself—the sponges in one package, the dressings in another, and the instruments in still another. These should not be undone until needed. Ligature and

suture material is coiled loosely around glass spools and placed in test-tubes, the ends of which are plugged with cotton. The cotton effectually excludes germs, while it in no way interferes with the application of heat, or even the free circulation of steam within the tube.

Fig. 22.—Boeckmann's Sterilizer (Tray for Instruments).

The best method of sterilizing catgut is still a moot question. A simple and efficient way is to soak the catgut in plain water for thirty-six hours at the ordinary temperature, then in a 5-per-cent. solution of formalin for a like period, when it is taken out and placed in glass jars containing alcohol. Just before it is used the jar containing it is placed in the sterilizer and allowed to remain twenty or

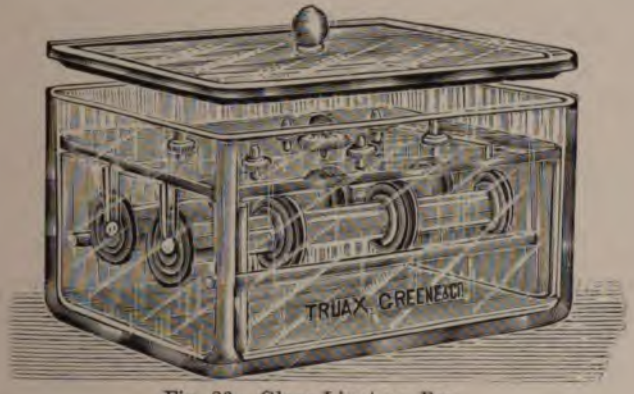


Fig. 23.—Glass Ligature Box.

thirty minutes. A gauze cover should replace the glass stopper to permit the escape of the vapors generated by the heat.

Sponges.—Gauze sponges have almost entirely supplanted the marine sponge, chiefly because of their availability and the ease and thoroughness with which they may be sterilized. They are easily prepared, and owing to their cheapness can be and are discarded after each operation. They are prepared by folding the gauze upon itself

several times and tacking the edges with thread, seeing to it that the raw edges are turned in. Pads of larger size and thicker than the

Fig. 24.—Glass Brush Box.

sponges are useful to protect the intestines where a long abdominal incision is made. A convenient size for the sponge is five inches

Fig. 25.—Cabinet for Dressings.

square, and that of the pad nine or ten inches square. The care of the sponges is one of the most important duties of the nurse, as it

is an object of solicitude to the operator. Many serious and fatal mishaps have occurred as the result of leaving sponges in the abdominal cavity after operation. Constant vigilance and methodical attention to the sponges are the only safeguards against this most

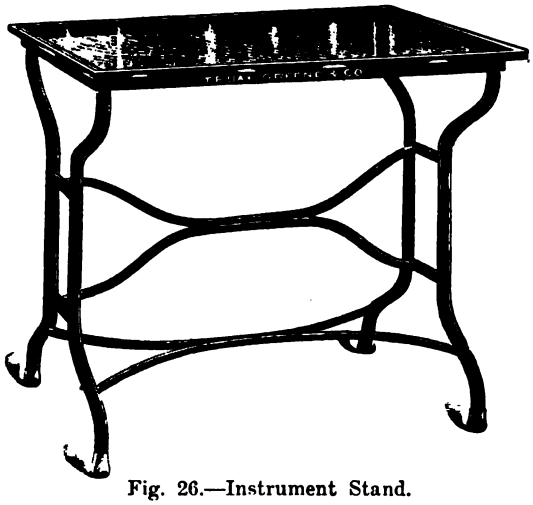


Fig. 26.—Instrument Stand.

deplorable accident. They should be carefully counted and arranged in dozen lots before sterilization, and again counted carefully before the operation. In counting them each sponge must be lifted up separately to be sure that two are not stuck together. One sponge

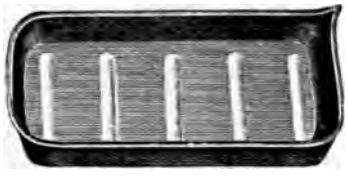


Fig. 27.—Instrument Tray.

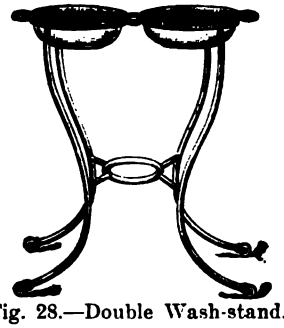


Fig. 28.—Double Wash-stand.

of each lot should be provided with a tape. This sponge is to be laid over the bowels while the incision is being closed, with the tape projecting at the lower angle and a forceps attached to it. It should be withdrawn before complete closure of the wound. After the completion of the operation and before the incision is closed, at a word

from the operator, the sponges are all counted again and again, and if any be missing it is sought for in the abdominal cavity. All sponges used should be dropped into a receptacle, and under no circumstances should a sponge be torn in two, or an individual sponge added, or a sponge thrown to one side where it is liable to escape observation. A very convenient way of keeping the sponges is to make a pocket at either end of a towel by folding and pinning, and placing six sponges in each pocket.

The Operator and Assistants.—They should take a general bath, using soap and brush. As the hands are necessarily brought in contact with the instruments, sponges, ligatures, and wound, *hand-*

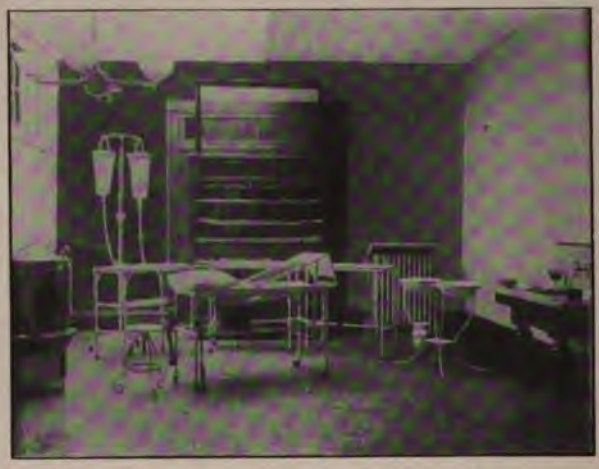


Fig. 29.—Operating Room at St. Anthony's Hospital.

cleaning constitutes the most essential feature of personal preparation. The hands should be first thoroughly washed with soap and water, and the dirt should be removed from under the finger-nails by the use of a nail-cleaner. After this a free use of green soap, soft warm water, and a hand-brush will complete the process. The scrubbing should be thorough and painstaking, and the water renewed from time to time. To make assurance doubly sure some operators supplement the scrubbing by the use of germicidal chemicals. One of the best of these is a combination of chlorid of lime and sal soda (preferably pulverized), which are taken into the hand from separate jars and reduced to a paste by the addition of a little water. This is rubbed into the hands for three minutes and washed

off with plain, sterilized water. Of late I have been using turpentine with satisfactory results. The turpentine, after being well rubbed into the hands, is washed off in a solution of green soap.

Aprons.—On or before entering the operating-room the operator and assistants should remove their coats, roll up their sleeves, and put on linen aprons. These should be large enough to encircle the body, long enough to reach to the ankles, and provided with short sleeves. They should be sterilized before each operation. Some operators prefer a jacket and trowsers of the same material, as being more elegant. The head should be covered with a sterilized turban of gauze or linen. But it is not sufficient that the gynecologist be clean for the operation only, he must be *habitually* clean. He who neglects his person for days and weeks at a time is little less than a microbe generator, and cannot expect to render himself sterile by a single bath and hand-cleaning. He must keep his finger-nails trimmed and clean. I would rather see a surgeon with crape around his hat than with black margins to his finger-nails. One signifies a death, the other

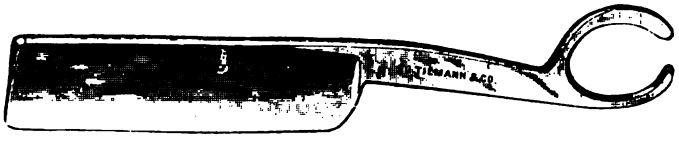


Fig. 30.—Robb's Razor for Shaving Pudendum.

homicide. Long finger-nails often work disaster in the abdominal cavity by cutting through bladder or bowel in the act of breaking up adhesions. The surgeon must not attend infectious diseases nor handle pathologic specimens. Practical gynecology and practical pathology are incompatible. A man must relinquish one or the other or open account with the undertaker. If brought in contact with an infectious case, either by operation or examination, he must forthwith purge himself by general bath, change of clothing, and repeated hand-cleaning. After such exposure abdominal work should not be engaged in for a period of several days.

The Patient.—The patient should have a general bath and the bowels cleared with an efficient cathartic. For an abdominal operation the pubic hairs should be shaved off. As a preliminary and most efficient aid to the cleaning process, a towel saturated with green soap may be laid over the abdomen and allowed to remain one or two hours. The surface is now scrubbed with soap and water, followed by the chlorid of lime and sal soda, as in hand-cleaning. The

abdomen is now inswathed in gauze or towels to await operation. Just before operating, and while the patient is under ether, the surface of the abdomen is washed with alcohol. For vaginal cleaning nothing serves the purpose better than a 5-per-cent. solution of creolin in green soap. Wads of absorbent cotton saturated with this solution are taken in the bite of a long forceps and the vagina thoroughly scrubbed. This is followed by a douche of plain, sterilized water. Thus prepared, the patient is placed on the table, the lower extremities enveloped in blankets, the night-dress drawn up under the shoulders to prevent soiling, and the abdomen bared. A sterilized sheet is now thrown over the patient. In the middle of the sheet is an opening through which the operation is performed. In lieu of the sheet, towels may be used. Two of these are placed lengthwise the body in such a way as to leave an uncovered space an inch or more in width along the median line. These are held in place by two other towels laid crosswise, one above and one below the field of operation, the ends of which are tucked under the patient. When metallic or glass tables are used, the patient should be protected from the chilled surface by a folded sheet or gauze pad.

ABDOMINAL SECTION.

As a large proportion of the intraperitoneal operations is reached through the abdominal parietes, and as the technique of abdominal section is common to most of them, it will be described here to avoid unnecessary repetition. The majority of sections are made through the median line, but should the exigencies of the case demand section at any other point, the method here described will apply to such with perhaps slight modifications which will suggest themselves to the intelligent surgeon. For general purposes the incision is made in the median line about midway between the umbilicus and pubis. The length of the incision will depend upon the nature of the case, and will vary from two inches to six or eight inches or even more. Unless there are obvious reasons for making a long initial incision, it is a good rule to make a short one, which can easily be lengthened after the abdominal cavity is entered.

The first cut will extend through the skin and superficial fat to the dense fascia overlying the muscles. It is now no longer considered necessary to follow the linea alba; hence no attention need be given to it. The knife may now be carried by gentle sweeps through the linea alba, if this be in line, or through the fascia down

to the muscle-tissue, if this be in line, being careful to keep the incision of equal depth along the whole line, as nothing is more confusing to the beginner than an incision of unequal depth, or a ragged conical hole in the abdominal wall. When the muscle has been laid bare a finger may be pushed through it, and with an upward and downward sweep the fibers separated. This exposes the pro-peritoneal fat, which may be lifted up with rat-tooth forceps and incised between them.

The peritoneum now appears, which under normal conditions is recognized as a thin delicate membrane which bulges into the wound. It is caught upon either side of the median line by rat-tooth forceps

Fig. 31.—Abdominal Section: Incising the Peritoneum.

and nicked with the knife. (Fig. 31.) Extreme care should be exercised that nothing but the peritoneum is included in the bite of the forceps, as otherwise the bowel or omentum may be wounded. When the peritoneum is opened the air rushes in and the bowels fall away. A peep into the opening as it is held up by the forceps will assure you that you have entered the peritoneal cavity and not an uplifted bladder or, perchance, a cyst of the abdominal wall, as it sometimes happens.

If all is well, as it usually is, a finger is introduced through the opening, and on this the peritoneum is split upward and downward with the scissors or knife. Care should be taken that the finger is

kept in immediate contact with the smooth internal surface of the peritoneum, to avoid injury to adherent intestine or omentum. Should adhesions between the peritoneum and contained viscera be found, as indicated by an absence of that softness and pliability that characterizes the normal peritoneum, the dissection must be carried forward with the utmost care, lifting up the delicate lamina on either side with the toothed forceps before incising them. It is usually safer and better to seek a point higher up or lower down or to one side, where the cavity may be reached without encountering adhesions. If

Fig. 32.—Knife for Abdominal Section.

for any reason it is found necessary to lengthen the incision after the cavity has been entered, it may readily be done by pushing a finger under the peritoneum in line with the incision and cutting on this with scissors. Should it be necessary to extend the incision above the umbilicus, it is better to make a circuit around and to the left of it, thereby avoiding the suspensory ligament of the liver.

Some surgeons affect a disdain for the conventionalities of abdominal section, and enter the peritoneal cavity with one or two bold

Fig. 33.—Scissors for Abdominal Section.

sweeps of the knife. Such belong to, or aspire to be classed with, the so-called brilliant operators, and sooner or later come to grief. It is true that under normal conditions the small intestines are so pliant and yielding as to elude the keen edge of a knife swept over them; but, should adhesions exist, which cannot always be foretold, disaster must inevitably follow this species of reckless surgery.

The bleeding from a median abdominal section is usually slight and evanescent. The blood, as it wells up, should be sponged away by an assistant, to keep the field clear. Spouting vessels should be

caught with pressure forceps and the larger ones tied at once. It should be the aim to check all bleeding before the peritoneum is opened, for, although sterile blood is harmless, it entails extra work on the peritoneum and affords an excellent *nidus* for germs.

Closure of the Abdominal Incision.—This may be done by interrupted or continuous suture. When a good sterile catgut is available, the continuous tier suture is the best. With a sponge over the intestines and under the line of incision,—a sponge with a tape to it,—the peritoneum is caught up with forceps on either side of the upper angle and the suture introduced and tied. It is now carried by an over-and-over stitch to the lower angle of the wound, the forceps preceding and lifting up the membrane. Here it is better that this suture be tied and cut that it may not act as a germ-carrier from the upper tiers, which occasionally become infected. In the meantime, and before complete closure of the incision, the sponge has been removed. The suture, beginning anew, is now carried upward, uniting the muscles. Turning again, it is carried downward, with short stitches, through the fascia and bringing the divided surfaces into close apposition. Here it is tied again. This is the layer upon which most depends as a fortification against post-operative hernia, and should receive attention accordingly. Finally, the edges of the skin should be brought together by the subcuticular stitch. This is done by entering the needle at the skin edge on one side of the lower angle of the wound and bringing it out about three-fourths of an inch above on the same side, the needle having passed beneath the superficial layer of skin and parallel to its surface. It is now carried across to the other side and entered opposite its point of emergence and another stitch taken similar to the first. Thus, by alternate stitches, first on one side and then on the other, the upper angle of the incision is reached, the suture drawn taut and tied. The result is a beautiful line of perfect coaptation, and not a stitch visible. As there are no stitches to remove, the dressings may remain undisturbed until solid union has taken place, or for a period of two to three weeks.

For the interrupted suture, silk or silk-worm gut is most frequently used, preferably the latter. The original and most simple method of using the interrupted suture is to grasp the abdominal wall on one side of the incision, so that the fingers will rest on the peritoneum and the thumb on the skin, and thrust the needle through. Then, grasping the wall on the opposite side at a corresponding point, the needle is again thrust through, but in reverse order to that in which it was passed on the opposite side. Thus, if it enters the

skin and emerges on the peritoneal surface of the first side, it enters the peritoneum and emerges on the skin of the other side. These sutures are placed about one-third of an inch apart throughout the length of the wound. As each suture is introduced its ends are secured by pressure forceps, one at either end, to keep them out of the way and prevent their accidental dislodgment. One pressure forceps on either side of the incision is sufficient to hold all the sutures unless the incision be longer than usual. The first stitch is introduced midway the length of the incision, in order the more certainly to bring the opposing sides in correspondence and secure more perfect coaptation. After all the sutures have been introduced their ends are grasped on one side by the operator and on the other by his assistant and lifted upward, while with the other hand each presses firmly against the abdominal wall just outside the sutures, thereby bringing the peritoneal surfaces together and as the sutures are tied effecting coaptation of the other layers. The sutures are now given into the hands of the assistant, from whom they are taken one by one by the operator, who, after a to-and-fro motion to assure himself that he has in hand both ends of the same suture, ties them. The sutures are removed about the tenth day. Modification of these methods according to individual preference are common, but all, or nearly all, are based on the technique described.

Dressings.—The patient is now sponged off, and, if the sheet upon which she is lying is soiled, it is removed and dry towels substituted. Sterilized iodoform gauze, several layers in thickness and of sufficient size to overlap the wound several inches in all directions, is now laid over it and glued to the surface with iodoform collodion. The collodion need only be applied to the margins. Over the gauze is laid a pad of sterilized cotton batting several inches thick and eight or ten inches square. This is held in place by adhesive strips. A four- or six- tailed bandage, of sufficient length to reach one and one-half times around the body, is now applied, the tails being crossed diagonally from above downward, except the two lowermost, which are given a slight inclination upward. The bandage is secured by safety pins. This completes the dressing.

After-treatment.—The patient is now put to bed and the dressings are not disturbed for a week or ten days, and not then unless for the removal of stitches, or because of soiling or suppuration. Soiling of the dressings can usually be detected by cautiously lifting the lower margin of the cotton dressing and peering under, or by staining of the bandage at the sides. Should soiling occur the dressings must

be removed immediately and replaced by others, and this must be repeated at short intervals so long as necessary.

Little Attentions.—For the first twenty-four or thirty-six hours after abdominal section the patient is restless, if not in actual pain. She seldom sleeps during the first night, is tormented by thirst, and not infrequently vomits. Gaseous accumulations in the stomach and bowels, which refuse to be expelled in the natural way, are raised by belching, and add to the patient's discomfort. The continued dorsal decubitus becomes constrained and irksome. The clothing and bedding are apt to become disordered and wrinkled, which adds greatly to her discomfort. The patient begs for water, for a sleeping potion, for something to control her vomiting and to be turned over in bed. Compliance with these requests is, as a rule, neither prudent nor practicable. A rectal injection of normal salt solution just before the patient is removed from the table will do much toward allaying the subsequent thirst. Neither water, food, nor medicine should, as a rule, be given by the mouth for twenty-four hours, or even longer if the stomach has not become settled. The lips may be moistened occasionally, or the patient may be allowed to take water in the mouth, with the injunction not to swallow it. On the second day spoonfuls of hot water may be swallowed, followed later by a little soda-water. When the stomach becomes settled the quantity of water may be increased to the normal or to meet the needs of the patient. Occasionally in hot weather, and especially in the absence of gastric disturbance, it is allowable to give water from the first, graduating the quantity by the effect on the stomach.

The wakefulness and vomiting are largely due to the anesthetic, and there are no known means of obviating them. Inhalations of the vapor from hot vinegar will sometimes allay the vomiting, but as often fails. The most efficient treatment is to keep the stomach empty. It is seldom necessary to give an anodyne. Tact and suasion and little attentions properly directed will do much to divert the mind and alleviate the distress of the patient. Changing the position of the legs, lifting up the knees and supporting them with a pillow, straightening them out again, untwisting and smoothing the clothing and bedding, especially that upon which the patient is lying, changing the pillows and gentle rubbing of the surface of the body are grateful to the patient, and will go far toward pacifying her. There should, however, be no hard-and-fast rule of practice. Exceptionally the most rigid rules will have to be observed, but most cases admit of slight departures according to the judgment of the attendant.

For great and persistent pain or even restlessness it is better to give morphine hypodermically than to subject the patient to the wear and tear of continued suffering. For unquenchable and imperative thirst one may take the chances of giving water, soda-water, lemonade, or tea, provided the usual methods have been tried and failed. Should the patient persist in her demands to be turned over, it is seldom that she may not be turned on her side and supported by pillows without danger or detriment. Common-sense, based on experience, is the best guide in all cases.

CHAPTER V.

GYNECOLOGIC TECHNIQUE—COMPLICATIONS AND SEQUELÆ.

SHOCK.

WHENEVER practicable, the bed should be warmed ready to receive the patient when she comes off the table. This is all the more imperative in case of shock. Hot bottles should be ranged around her, being careful that they are securely corked and that some woolen fabric intervenes between them and her person. Serious and even fatal burns have resulted from neglect of these precautions. The foot of the bed should be elevated, strychnia given hypodermically in doses varying from $^1/_{30}$ to $^1/_{15}$ grain, followed, if necessary, by stimulating rectal enemata. The strychnia may be repeated at intervals of from one-half hour to an hour until the shock is abated or until twitching of the muscles indicates that the limit of physiologic action has been reached. It is seldom necessary to exceed 1 grain of the drug in all. A very efficient rectal injection is found in the mistura asafœtidæ, with which an equal quantity of hot water may be thrown up every one or two hours in quantities of from 4 to 8 ounces. Shock, in itself, as a result of abdominal operation, is seldom fatal. Crile, of Cleveland, who has given much patient research to the subjects of shock and collapse, recommends equable pressure over the surface of the body for the former and the administration of adrenalin for the latter. He has devised an inflatable rubber suit for patients suffering from shock by means of which a pneumatic pressure may be exercised over the entire surface of the body. In the absence of a contrivance of this kind bandaging the limbs and trunk would be a valuable substitute. The bandaging should be done adroitly and quickly in a very warm room. A flannel bandage is preferable.

HEMORRHAGE.

The collapse from hemorrhage sometimes simulates shock so closely as to be with difficulty distinguished from it. If the patient be put to bed in fairly good condition, and after the lapse of several hours she be found with a rapid pulse, subnormal temperature, sighing respiration, and cold and clamy skin, it is more than probable

that she is suffering from internal hemorrhage. Sometimes the patient is anxious and restless, but quite as often apathetic. Unfortunately there are no signs or *ensemble* of symptoms by which we can differentiate with precision between shock and hemorrhage. Especially does this apply to neurotic women. It is said that livid spots here and there over the surface, indicative of capillary stagnation, are pathognomonic of shock.

The treatment of internal hemorrhage is, in many respects, similar to that of shock. The rectal injections and the use of strychnia should be dispensed with as calculated to encourage the hemorrhage by increasing the heart-power and dilating the splanchnic vessels. Atropine is a very valuable agent, and may be used in doses of from $^1/_{100}$ to $^1/_{50}$ grain, applied to any mucous surface. Ergot, either as a clyster or hypodermically, should be used freely and fre-

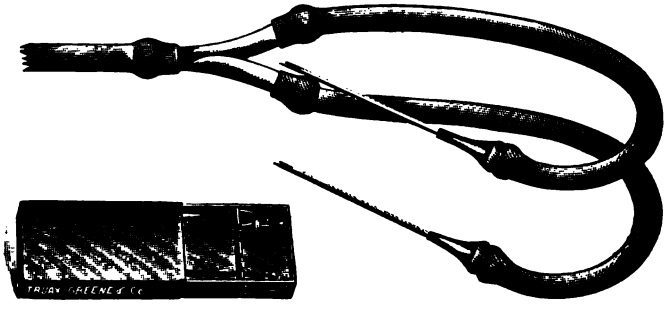


Fig. 34.—Saline Solution Injector.

quently. The injection of the normal salt solution into the submammary cellular tissue is one of the most valuable means of counteracting the loss of blood. It should be given by gravity. A very convenient way is to attach an aspirating needle to the tube of a fountain-syringe, and, grasping the mammary gland in the hand, lift it from its bed while the needle is thrust under it into the cellular tissue. The reservoir should be elevated from four to six feet above the level of the patient and the needle left in place until the breast is thoroughly distended. The other breast may be injected in like manner. Absorption of the fluid is rapid, even in cases of extreme depression, while the increased volume of the pulse and vivifying effects on both mind and body indicate that the fluid has found its way into the general circulation. Most authorities advocate the reopening of the abdomen and searching for the bleeding vessels. Such, however, is the difficulty of diagnosis, and of determining the

amount and character of the hemorrhage, so many cases recovering from apparently hopeless depression, and so great is the danger from operative interference,—danger from shock and from sepsis,—that it is a serious question whether more lives are not sacrificed than saved by it. My own experience in both directions argues forcibly against operative interference. Still, where there are good grounds for suspecting an active arterial hemorrhage, it is better to reopen and search for the bleeding vessels. A preliminary small opening should be made to the peritoneum, and a silver probe introduced through this into the cavity, when, if hemorrhage exists, it will well up through the opening. This and the subsequent operation, if any should be required, would better be done without an anesthetic. It is needless to say that every possible precaution should be taken against infection.

SEPSIS.

Sepsis is the most formidable foe of the abdominal surgeon. It destroys more of his patients than all other causes combined. His aim and object and greatest solicitude is to forestall it, for he knows full well that in this lies the safety of his patient. Tait, the gifted champion of modern abdominal surgery, in the heyday of his early achievements, misinterpreted the work of his own hands, and fell into the error of believing that he could battle successfully with bacterial infection. Speaking of one of his contemporaries, he quotes him as saying: "It is the peritonitis that beats us," and then, speaking for himself, he adds, with unconcealed exultation: "We beat the peritonitis." We now know, and doubtless he knew long before his death, that it was not the salts that beat the peritonitis after the operation, but soap and water before, and clean hands and a clean field during, the operation.

It would require more time and space than is consistent with the compass of this work to give an intelligent description of sepsis in all its varied details. All that can be done here is to touch upon a few of the more salient points. True, there are grades of sepsis and kinds of sepsis, swift and slow; but the sepsis that follows the knife into the peritoneal cavity and lights up a general peritonitis, or involves the general system by percolating the vascular channels, is the sepsis that concerns us here. This kind has a period of incubation of from thirty-six to forty-eight hours, during which it gives no sign. The intervening period may be stormy or calm. The patient may, or may not, be more than ordinarily restless. She may, or may

not, have inordinate pain. She may, or may not, vomit more than usual. She may, or may not, have an accelerated pulse or be disturbed in mind. All this has nothing to do with the holocaust that is coming. We shall take for a type the ordinary case. She has experienced the usual amount of pain, of restlessness, of vomiting, and at the end of twenty-four hours she has settled into the usual calm. In the meantime the incubating process has been going on in the pelvis, silently, swiftly, and in geometrical ratio, until suddenly a million microbes mount into the peritoneal cavity. The onslaught is so fierce and furious, so vast and irresistible, as to carry everything before it. Confusion reigns. Physiologic processes are reversed, and everything is working at cross-purposes. The stomach expels its contents upward, the intestines stand still, and the pulse runs riot. The patient whom you left calm and composed at your last visit now gives token of impending trouble. By consulting the chart you will see that the pulse has gone up. Gradually and by easy stages it has crept up to 85, 90, 100, 110, 120. It is small, quick, sharp, and strikes the finger like a vibrating wire. She has vomited, first some clear water, then mucus, then bile, then brownish fluid. She is restless and tosses from side to side. She is apprehensive, then panicky, and finally merges into hopeless despair. From the first she has an intuition that the hand of death is upon her. Her face becomes anxious and drawn. Her eyes are sunken and blaze with an unnatural light. They are fixed upon you with eager, anxious questioning, or roll from side to side with furtive and frightened glances. She presents a pitiable picture of one that is hunted, a picture that, once seen, will haunt you in return. Well may she tremble and cast about affrighted, for the pursuer is hot on her trail, and neither fleetness of foot nor earthly power shall avail to deliver her from his clutches. His name is Death. The temperature goes up, but bears no fixed relation to the pulse. The bowels are paralyzed and distended with gas. They are obstinately constipated and respond to neither clysters nor cathartics. Neither flatus nor fecal matter passes the rectum. The abdomen is distended and tympanitic, smooth, shiny, and resonant as a drum. It first appears as a resonant fold at the epigastrium, and rolls over the upper margin of the bandage. The pulse mounts higher and higher and becomes a mere running thread; the skin becomes cold and clammy, the vomiting brown and offensive. Two days of silent preparation and two days of tumult give the battle to the germs, and on the night of the fourth day the victim goes to rest.

There is another form of sepsis as irresistible and as unerringly fatal in which there is no abdominal distension, no peritonitis, but which in other respects is very like that described above. This may be fulminant in character, causing the death of the patient in a few hours, but usually it is slower and runs its course in a week or ten days. In this form the patient is apt to complain of dull, heavy pains in various parts of the body and extremities, experiences chills and profuse sweats at irregular intervals; the temperature line is zig-zag, sometimes mounting to 105 or even higher, and again dropping to or below the normal. Toward the end a colliquative diarrhea sets in. Nervous apprehension is not invariable, for some patients are placid and hopeful to the last. They are sometimes bright and sometimes lethargic, but more frequently the latter. I have frequently inquired of such: "How do you feel this morning," to which the cheery reply would come: "First rate" or "Much better, thank you," and this, too, when the skin was of cadaveric coldness and the death-dew was gathered on the brow.

Let it be borne in mind that a gradually ascending pulse associated with vomiting, declaring on or about the second day, are ominous of evil and strongly suggestive of sepsis.

Treatment.—The Murphy treatment of diffuse suppurative peritonitis by the Fowler position, pelvic drainage, and proctoclysis, is meeting with such measure of success as to place this once much dreaded affection in the category of curable diseases. The Fowler position, which consists in placing the patient in the semi-sitting posture, drains the bacteria-laden fluids away from the diaphragm, where absorption is most active, into the pelvis where it is least active, from whence by pelvic drainage it is removed entirely from the body, thus preventing or limiting systemic infection. On the other hand, the lymphatics become engorged with the salt solution absorbed from the bowel after rectal instillation and refuse the poisonous products of the germ infected area. The drainage should be made through fenestrated or split-rubber tubes, introduced to the bottom of the abscess cavity and taken out at the most dependent place —at the lower end of the incision or through the vault of the vagina. Rectal instillation of the normal salt solution may be administered by the ordinary fountain syringe. The vaginal nozzle with its multiple openings is preferable, which should be bent at right angles three inches from the end to prevent pressure on the posterior wall of the rectum. (It can be bent over a spirit flame.) This is introduced into the rectum up to the angle of the bend and secured in place by

strapping the tube to the thigh with adhesive strips. The salt solution is delivered drop by drop, about a pint or pint and a half being instilled to the hour. The rapidity of instillation is regulated solely by the height of the fountain, which will vary from six to fourteen inches above the level of the anus according to the intravisceral pressure to be overcome. No clamp or other device for retarding the flow through the tube is permissible, as it is important that there should be no obstacle to the expulsion of flatus or bowel matter through the same. The solution should be replenished every two hours and kept at a temperature of about 100 by surrounding the fountain with hot-water bottles. The irrigation should be maintained for several days. For maintaining the patient in the Fowler position I have found the adjustable canvas chair most convenient and comfortable. Usually the head of the bed is elevated and some sort of support provided for the buttocks. As adjunct to this treatment Murphy insists that no water be given by the mouth, and that eight hours after operation mild catharsis be instituted by small doses of calomel. Unfortunately there has not been a corresponding advance in the treatment of puerperal peritonitis or that form dependent on streptococcus infection. This is largely due to the fact that the germ occupies the lymph spaces and subperitoneal cellular tissue, and cannot be drained away. Also to its virulence which overcomes all the barriers oposed by nature, and the rapidity with which it gains entrance to the general circulation. Here the Murphy treatment may be supplemented by light packing of the pelvic cavity through a free opening through the vault of the vagina back of the uterus with gauze. Davis saturates the gauze with a saline solution through an opening above the brim of the pelvis; Pryor uses iodoform gauze and also lightly packs the uterus with the same, believing that the liberated iodine possesses specific antistreptococcic properties. These packings should be removed little by little as the condition of the patient improves. Murphy advocates the antistreptococcus serum in these cases. In the symptomatic treatment of septic peritonitis the indications are to control vomiting, relieve abdominal distention, quiet pain, and sustain the bodily powers. Owing to the absence of absorption and oftentimes paralysis of the intestinal tract, medicines given by the mouth are practically useless. For the vomiting and abdominal dis-

Fig. 35—Canvas Chair No. 50. Made by Kalamazoo (Mich.) Sled Co.

tention nothing is so efficacious as gastric lavage. The relief following its use is so marked that patients after one experience will often ask for a repetition. With the Murphy treatment there is no call for the rectal tube and less for oral medication aside from mild cathartics. Puncture of the bowel is of no avail to relieve distention, though an enterostomy might be of service in some cases. Strychnine in $^1/_{30}$-grain doses may be given hypodermically to sustain the heart. Overzealous and persistent use of drastic measures are to be deprecated as tending to increase rather than abate suffering. Should all prove unavailing and the patient is going from bad to worse, nothing will allay her sufferings, physical or mental, so quickly or effectually as morphine. This should be given in liberal doses and frequently repeated so as to obtund sensibility.

INFECTED WOUNDS.

Stitch-hole Abscess.—If a wound becomes infected, as evidenced by a dusky or unhealthy appearance of the tissues, accompanied by pain and fever, it should be opened up and assiduously dressed with antiseptics. An open surface with free drainage and frequent cleansing will usually suffice without the use of chemical antiseptics. In case of a stitch-hole abscess the offending stitch or stitches should be removed at once and the wound cleansed every few hours. In the event of an infected wound leading down to, but not through the peritoneum, great care should be exercised not to open into the cavity, lest fatal septic infection of the peritoneum ensue. Where pus is formed within the peritoneal cavity and is making its way to the surface it should be allowed to point, or at least to have formed circumscribed adhesion, before the knife is used. The surrounding induration and fixation of the tissues will be the guide, and the opening should be cautiously made within this area.

ABDOMINAL FISTULA.

The simple purulent fistula is by far the most common form of fistula following abdominal operation. It is usually the result of an incomplete operation, or infection of the ligature material. In plain words, it means that there is something within the cavity that is acting as an irritant or as a foreign body and which Nature is making an effort to expel by keeping an open way. If a pus-tube or any such diseased structure be left behind, especially if its relations have been disturbed by ineffectual attempts at removal, a fistula is likely to ensue. These fistulæ may, and usually do, persist until the offending body is removed. An infected ligature will in time come away

spontaneously, either in its entirety or in shreds. It sometimes finds an outlet through the bowel or bladder, and escapes unobserved. It may sometimes be fished up through the fistulous tract by a delicate hook or slender forceps, but, as a rule, such efforts are futile, and it is better to await spontaneous expulsion and in the meantime keep the parts as clean as possible. Fecal fistulæ follow rupture of the bowels, at or subsequent to the operation. If a bowel be torn or cut during the operation it should, if possible, be repaired at the time. Sometimes it is inaccessible, as in ruptures of the rectum deep in the pelvis, when all that can be done is to facilitate the discharge of fecal matter *per vias naturales*, to limit the peristalsis, and provide for drainage. A gauze drain should be inserted leading from the damaged bowel out through the lower angle of the abdominal incision. This may be removed in from twenty-four to thirty-six hours. Meanwhile a wall will have been built around it which will give vent to the extravasated intestinal contents without danger of infecting the general peritoneum.

In case of damage to the bowel which threatens subsequent sloughing or rupture, and where it is found impracticable or inexpedient to repair or resect the damaged portion, the same expedients in regard to drainage should be resorted to as advised for rupture. Before the patient is taken from the table, a thorough dilatation of the rectum should be made, and in bad cases a division of the sphincter ani to insure an easy and unobstructed passage of the intestinal contents. For the first two days the bowels should be left undisturbed, after which a laxative may be given, and thereafter the bowels should be kept soluble. The promptness with which Nature fortifies against the exigencies of a fecal fistula is at times surprising. In years past, when the glass drainage tube was in frequent demand, I have withdrawn fecal matter from it within six hours of the operation. Within this brief period Nature had made a channel and built a wall around it to protect the general peritoneum. Where the injury to the bowel is not recognized at the time of the operation, and the abdomen closed without drainage, the fecal matter will usually make a track of itself and in a few days find exit through the wound. This is accompanied by severe systemic reaction and accelerated pulse. When the matter has found an exit free vent should be provided for it by loose and absorbent dressings. Formalin may be used—1-per-cent. solution—as a deodorant and antiseptic, and the parts kept clean by frequent dressings. Most fecal fistulæ close spontaneously after a few weeks or months.

HERNIA.

A very considerable proportion of abdominal sections is followed by hernia. This is especially true of sections followed by suppuration. Hernia may occur, however, in cases that have healed kindly, but in which, by reason of faulty technique, the parts have not been properly coapted. Indiscretion on the part of the patient, such as overexertion or straining soon after the operation, is sometimes responsible for this untoward sequel. It first manifests itself as a small, soft pouting in the line of incision, which, if neglected, gradually enlarges until it involves the entire length of the incision. To guard against hernia following suppuration and cicatrization of the section wound there are, unfortunately, no preventive measures that are effectual. Many have conceived the idea that, as scar-tissue is dense and resistant, it will oppose an effectual barrier to hernial protrusion. This is fallacious. Scar-tissue, though dense, will not resist the steady, sustained intra-abdominal pressure, because it is of too low vitality and is not constantly renewed as are the live tissues.

Much may be done to obviate hernia under ordinary circumstances by care after the operation. The patient should avoid a too early getting up, should guard against straining and overexertion, and should wear a snug-fitting bandage. There is a growing disposition among gynecologists to underrate the bandage. There are some that go so far as to assert that the bandage is of no benefit whatever as a support to the abdominal walls. Nevertheless, even the most rabid of these protestants will utilize the bandage as a first dressing and continue its use until the patient has left her bed. This goes to show that even such have faith in the bandage that they are unwilling to admit.

The treatment of post-operative ventral hernia may be palliative or radical. As a palliative measure a properly fitting truss and abdominal supporter will often render the patient quite comfortable, but it will neither cure nor, as a rule, prevent the gradual enlargement of the hernia. The radical cure is only to be accomplished through operation. In most instances the abdominal contents are adherent to the sac, and the peritoneal cavity should be entered cautiously lest a bowel be injured. It is better to make the primary incision above or to one side of the hernial protrusion and far enough away as to avoid the adhesions. Once into the cavity, the section can be carried down the median line after a preliminary separation of the adhesions. Redundant tissues should now be excised, cicatricial tissue removed from the margins of the opening, and the different layers

of the abdominal wall separated and brought into apposition with similar layers on the opposite side, and secured by suture.

FLUSHING AND DRAINAGE.

Flushing the peritoneal cavity after operation with plain sterilized water or the normal salt solution at a temperature somewhat higher than that of the blood is a routine with some operators and possesses some advantages. When a quantity of the warm fluid is left in the cavity, as is usually the case, it diminishes shock by maintaining the bodily warmth. It also abates thirst. The chief claim of its advocates is that it lessens the chances of sepsis by washing away and diluting the germs. It is questionable whether it subserves any valuable purpose in the way of preventing germ infection, and, as it is apt to soil the clothing and table-cover, it becomes objectionable. It should not be used where hemorrhage is feared or where oozing is going on, as it encourages hemorrhage. As far as I have been able to judge, it neither tends to save nor destroy life, as equally good results are obtained with and without flushing.

There is no question connected with abdominal surgery that has been so fully discussed and so fiercely contested as that of drainage. Clinical experience and scientific investigation have demonstrated that in the great majority of cases drainage could be dispensed with, not only with safety, but to advantage. Still, there are occasions when a drain becomes apparently necessary:—

1. When abscess-cavity has been opened and the pus-producing cause cannot be removed.

2. When from injury to the bowel or bladder or other viscus an escape of their contents into the peritoneal cavity is feared.

In the latter event the gauze drain answers every purpose. One end of a strip of gauze should be placed in contact with, or in the immediate vicinity of, the danger-point, and the other brought out through the abdominal incision, usually at its lower angle. This end should be enveloped in sterilized absorbent cotton and the dressings so adjusted that it can be changed without disturbing the permanent dressings. This cotton should be removed and fresh cotton substituted as often as it becomes saturated. Sometimes where there is much oozing or venous hemorrhage the gauze may be utilized as a hemostatic compress, or packing and drain combined.

Drainage.—The present day methods of drainage are by gauze and rubber tubing. Rubber tubing will drain anything that flows and in any situation, but will not drain against gravity unless the fluids

are forced up through it by pressure—intra-abdominal pressure or resiliency of the tissues. It is evident, therefore, that the tubal drain to be most efficient, should be so placed as to drain from the most dependent part. On the other hand, gauze or capillary drainage will not drain thick matter—blood or pus—but will drain light fluids against gravity, provided it is in sufficient quantity to meet the demands of the occasion; that it is of equal thickness throughout its length, and that its outer end is in contact with an absorbent dressing. In the peritoneal cavity the gauze drain excites a flow of serum which dissolves the pus and blood-clots and renders them capable of capillary drainage. The flow of serum is proportional to the amount of gauze in contact with the peritoneum, hence extensive drainage requires much gauze. Gauze is ill-suited for the drainage of walled cavities, for in this situation its presence does not excite a flow of serum. Here the fenestrated or split-rubber tubing is most efficient. In the general peritoneal cavity the drain, of whatever character, becomes walled off in a few hours, so that a gauze drain, becoming clogged for want of the serum solvent, may obstruct, rather than favor, the discharge. It is better, therefore, to remove it within forty-eight to seventy-two hours unless associated with tubular drainage. A split-rubber tube, filled with gauze, the gauze protruding from either end, makes an admirable drain in cases where the drainage is to be maintained for considerable length of time.

In considering the question of drainage it must not be forgotten that it is to the natural resources of the economy that we are to look for safety. The mere introduction of the drainage tube does not prevent inimical products from diffusing themselves in other directions. It is Nature that circumvents and walls them in by throwing out plastic matter and agglutinating the viscera. Without this co-operation all our efforts at drainage would be absolutely without avail. After this the drainage tube furnishes an artificial route by which noxious matters may be expelled. But even this artificial way is not essential, at least in the vast majority of cases, for with almost unerring instinct Nature will provide a walled-in route leading to the outer world, through which the offending matter may be discharged. Where an abdominal incision has preceded, the opening will almost invariably be at some point along the line of incision, and this, too, despite the fact of close suturing. Should the pathogenic products be of great virulence, such as sometimes occurs in puerperal sepsis or other allied conditions, they will respect no boundary-lines with or without drainage, and will diffuse themselves throughout the cavity.

CHAPTER VI.

DISORDERS OF MENSTRUATION.

MENSTRUATION, as the name implies, is a monthly flow of blood—from the female genitals. The blood comes from the uterine cavity, and is furnished by the endometrium. In this latitude the function becomes established at or about the fourteenth year, and extends through a period of from thirty to thirty-five years. This period, which is co-extensive with the capacity for child-bearing, is known as the sexual life of woman. In hot climates the function begins somewhat earlier, and in cold climates later in life. The cause of menstruation is unknown. Its purpose is not clearly defined. It is supposed to have both a general and local significance. The changes that take place in the endometrium coincident with menstruation are supposed to favor conception and provide for the lodgment and development of the ovum. This, notwithstanding the fact that animals with the exception of the monkey do not menstruate. The systemic influence of menstruation is attested by the fact that women feel better when the function is regular and normal.

Coincident with the establishment of menstruation the physical, mental, and moral natures undergo great changes. The girl becomes a woman. She takes on the lines and curves that distinguish the mature female from the male. The increased development of bust and hips and general fullness of contour add greatly to her attractiveness, and proclaim her readiness for motherhood. She suddenly awakens to a realization of her social *status* and becomes reserved, dignified, and demure.

The average period of a single menstrual effort is from four to five days. The amount of blood lost varies from four to eight ounces. The menstrual fluid, though apparently pure blood, is really composite in character. It consists of blood, mucus, epithelial cells, and *detritus*. In normal menstruation this is always fluid. Coagulation is prevented by the presence of lymphoid elements, of which we shall speak directly. The endometrium is a membrane peculiar to the uterine cavity. Its counterpart does not exist elsewhere in the economy. In appearance and position it resembles mucous membrane, but in histologic formation it partakes of the nature of lymphatic tissue. It is intimately adherent to and blends with the subjacent

muscular structure. The lymphoid cells with which it abounds play an important rôle in the changes incident to menstruation. A pelvic congestion, especially marked in the vicinity of the endometrium, precedes and accompanies the menstrual act. The epithelial covering of the endometrium is thrown off, not in the form of flakes, but rather as individual cells. In other words, it melts away. To what agency this solvent action on the intercellular substance is due is not known. Thus exposed, the overdistended capillaries rupture and pour out blood into the uterine cavity, or, what is more probable,

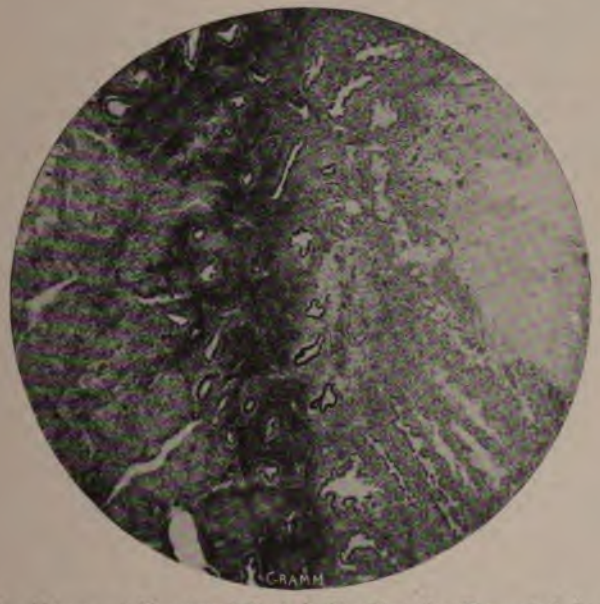


Fig. 36.—Uterus at Menstrual Period, Showing the Congested Area and Destruction of Mucous Membrane. (Photomicrograph by Gramm.)

the capillary rupture precedes the exfoliation, the effused blood serving to push off the epithelium. The blood mingled with the natural secretions, the broken-down remnants, and the epithelial cells constitutes the menstrual fluid. With the cessation of menstruation the lymphoid elements of which we have been speaking build up anew the lost epithelial covering and develop in vast numbers in the substance of the endometrium to provide a rich and succulent base for the lodgment of the ovum.

All women do not menstruate at regular intervals of twenty-eight days. Some menstruate only once in five or six weeks; others

every two or three weeks. Exceptionally, women menstruate at much longer intervals. Different women menstruate at different periods of the month. It is noticeable, however, that many women menstruate at or about the same time. Some women habitually menstruate scantily, others profusely. Deviations from the type, either as to time or quantity, do not necessarily constitute an abnormality. Menstruation that is regular or irregular, scanty or profuse, frequent or infrequent, if habitual through life and accompanied by no sense of discomfort or evil consequences, may be considered normal for the individual.

PRECOCIOUS AND DELAYED MENSTRUATION.

Instances are not rare in which menstruation makes its appearance at an earlier period than that cited in the schedule above. Thus, it has declared so early as the eighth or tenth year, or even soon after birth. In all such cases an abnormal development of the genital apparatus is noted. On the contrary, menstruation is sometimes delayed for several years. This generally betokens enfeebled health or want of development. An early menstruation presages a late menopause. This is contrary to the popular belief, but will hold good in the majority of cases.

MENSTRUAL PRODROMES.

Very frequently, especially among the high-strung and erethismal, the menstrual *dénouement* is heralded by various disturbances of the nervous, vascular, and digestive apparatuses. These are usually distinctly periodical, coming and going at monthly intervals, and if closely observed will furnish the key to the situation. They sometimes anticipate the menstrual flux by many months or even several years. They consist of headache, backache, pelvic pain and fullness, alternate periods of hilarity and depression, hysterical manifestations, epileptoid seizures, gastric and intestinal dyspepsia, besides many other phenomena. Cutaneous eruptions are common at this period, and, like most of the other associate morbid manifestations, are rebellious to treatment. All these vanish when the function has become established. The establishment of menstruation is not the work of a day. Occasionally it has no precursors, makes its *début* without ado, and holds an even course. More often, after one or two periods characterized by some deviation from the normal standard, there will be a lapse. These interruptions may occur at irregular intervals for a year or more. They are apt to give rise to appre-

hension on the part of the parents, but, so long as the young woman retains her usual health, assurance may be given that all will be well in the not distant future. In interrupted, delayed, or scant menstruation, a loss of blood, periodical in character and corresponding in time to the normal menstrual flow, sometimes occurs from some other organ than the uterus. In the absence of the normal flow this acts as a substitute, or, where the normal flow is insufficient, this becomes supplemental. It is hence known as *vicarious menstruation.* Also because of its unnatural location it is called *ectopic menstruation.* Vicarious menstruation may occur at almost any point, but more frequently springs from the food- or air- passages, the bladder, skin, erectile tumors, or old sores.

MENOPAUSE.

The cessation of menstruation is known as the menopause. It is commonly called the change of life. It occurs usually at or about the forty-seventh year, though it may occur at a much earlier or later period of life. It seldom manifests suddenly, but, on the contrary, the phenomena attending the change extend over a period of several years. Menstruation goes, as it comes, by fits and starts, but, as a rule, leaves with more reluctance than it came. The cardinal and only reliable sign of an approaching menopause is irregularity. The flow is irregular as to time and quantity. This, taken in connection with the age of the patient, furnishes a reasonably reliable basis for diagnosis.

The change is usually attended by the same class of disturbances that precede the establishment of menstruation. These are, for the most part, functional, and pertain to the nervous, vascular, and digestive apparatuses. One of the most constant is that of flushing. These "hot flashes," as the women call them, are annoying and at times almost insufferable. Dizziness, faintness, mental depression, forgetfulness, and other perverted nervous manifestations are not uncommon. Dyspepsia and disordered action of the stomach and bowels are frequent. Inordinate sexual appetite sometimes characterizes the change. Suppression of the menses for one or several periods, followed by an excessive flow, is not uncommon. The patient and her friends are apt to regard such flowings as the natural and legitimate accompaniment of the change and give themselves no concern. An excessive flow from the uterus is a sure index of some pathologic condition, and should be inquired into carefully. With the advent of the menopause marked changes take place in the genital

apparatus. These are of a retrograde character. Fallopian tubes, ovaries, and uterus atrophy. The external genitals shrivel and shrink; the breasts become sunken and flabby.

Treatment. — The treatment should be largely symptomatic. General hygienic management is of the greatest importance. The bowels should be kept regular and the food should be plain and nutritious. Regular hours should be insisted on. Light work or something to employ the hands and mind is preferable to idleness. This should be interspersed with pleasurable diversion. The bromids, especially the sodium bromid in 10- to 30-grain doses, three times a day, is useful in combating nervous disturbances. Sodium phosphate in 10-grain doses, or guaiacol carbonate will relieve flatulence and check fermentative dyspepsia. Opiates and alcoholic stimulants should be used guardedly and emmenagogues not at all. Moral suasion will go far toward relieving mental disquietude.

AMENORRHEA.

Amenorrhea is the absence of menstruation. The term does not apply to the physiologic absence of menstruation at the extremes of life, nor to that which is incident to pregnancy. Absence of the outward signs of menstruation, where the fluid is pent up, as in atresia of the genital tract, does not constitute amenorrhea. Primary amenorrhea, or *emansio mensium*, is that form in which menstruation has never been established. Secondary amenorrhea, or *suppressio mensium*, is that form in which menstruation ceases after having been established.

The causes of amenorrhea are local and general. The local causes pertain to the genital organs, especially the internal organs of generation, and consist in the want of development, on the one hand; premature atrophy, on the other, as in superinvolution following pregnancy, and various other pathologic lesions affecting the genitive apparatus. There is reason to believe that disorders of the nervous apparatus dominating the genital organism is sometimes responsible for amenorrhea. From a systemic point of view, two things are essential to normal menstruation: good blood and unimpaired nervous energy. Anything tending to impoverish the blood or impair the nervous energy may act as a cause of amenorrhea. Acute diseases, such as typhoid fever, cholera, and the exanthemata; chronic diseases, such as Bright's disease and consumption; and other pathologic states, such as anemia and chlorosis, are frequent causative factors of amenorrhea. The same may be said of many other conditions

which profoundly affect the nutritive processes of the economy. Change of climate and condition will not infrequently give rise to amenorrhea. This is to be observed in emigrants; also in women who enter upon a new vocation, as that of nursing. Insufficient food, mental or physical exhaustion, sedentary habits, and unhygienic surroundings are severally or combinedly responsible for many cases. To this list may be added anxiety, apprehension, deep desire, and sudden and violent emotions. The unmarried woman who, by reason of illicit relations, fears pregnancy, and the wife with an intense yearning for motherhood, are alike liable to miss several periods through anxiety. Scanty or suppressed menstruation often accompanies rapidly developed or excessive obesity. Acute suppression of menstruation frequently follows a shock, a traumatism, or, more commonly still, exposure to cold while menstruating.

Treatment.—The treatment of amenorrhea will depend on the underlying causative factor. Diligent inquiry should be made into the general physical and mental condition of the patient, her mode of life, and hygienic surroundings. This should be supplemented by a careful pelvic examination. The possibility of pregnancy should always be borne in mind, especially in suppressed menstruation, and no radical treatment instituted until this has been excluded. For the primary amenorrhea, due to the defective development of the genital organs, little is to be expected from treatment. The same may be said of the amenorrhea from superinvolution following pregnancy. The amenorrhea from exhaustive disease will usually correct itself with, or soon after, the establishment of convalescence. In diseases which tend to death, as in pulmonary tuberculosis, the function is never re-established. People habitually look upon the amenorrhea as the cause of their ill health, instead of the consequence, which it really is. That form of suppression which arises from change of climate or condition is also self-regulating after the patient has become acclimated or reconciled to the new order of things.

In a general way, good wholesome food, regular hours, fresh air, sunlight, and judicious exercise, with such other measures as may be suggested by the state of the blood and nervous system, are the indications in the way of treatment. Anemia and chlorosis should be treated by appropriate remedies, and obesity reduced, when possible, by diet, exercise, and such other treatment as may be found efficient and not detrimental to health. The alternate use of the Vichy and Kissingen salts are occasionally effective. Overwork, mental and physical, should be interdicted, and sedentary habits changed to a

more active out-door life. The acute suppression from exposure to cold is frequently associated with an acute endometritis, and calls for rest in bed, laxatives, hot applications to the hypogastrium, and uterine sedatives, such as pulsatilla and viburnum. Aside from the hygienic management, which is of paramount importance, certain drugs have been found beneficial and are habitually resorted to. If the patient be anemic, which is usually the case, iron is indicated. This may be given in various forms and combinations. Tincture of iron, which has been long prepared, is very efficient in 20-minim doses after meals. The tincture of iron, like wine, improves with age. Should there be a malarious tendency, or need of a general tonic, quinia may be combined with it. The Blaud pill is one of the most satisfactory forms in which to administer iron. One pill should be given three times a day, and the dose increased by one pill a day until three are given after each meal. Where renal insufficiency exists,—which, by the way, is a not unusual cause of amenorrhea,—Basham's mixture will be very serviceable. Arsenic and strychnia are valuable adjuncts, and are much used in combination with iron. A very eligible prescription is as follows:—

℞ Liq. potas. arsen. ..... 3j.
Tinct. nucis vomica ..... 3ij.
Vini ferri amari ..... 3vj.
M. Sig.: A dessertspoonful after meals.

The permanganate of potassium and the binoxid of manganese are among the most efficient promoters of menstruation. They should be given in 1- or 2-grain doses three times a day, with plenty of water and on an empty stomach. Oxalic acid in $^1/_2$-grain doses is also very effective.

Electricity in its various forms is often beneficial. For the functional disturbance, dissociated from organic defects or changes in the uterus or appendages, the faradic current is one of the most efficient measures for the restoration of the function that we possess. One electrode should be introduced within the uterine cavity and the other over the lumbar region, and a pleasantly strong current passed for ten or fifteen minutes; this treatment to be repeated daily or at intervals of two or three days. For the amenorrhea depending on defective development or superinvolution of the uterus and adnexa, the constant current with the positive pole to the back and the negative pole within the uterus is indicated. The so-called emmenagogues, such as rue, savin, and tansy, are dangerous, and should not be resorted to empirically. Probably there is no more efficient local agency in the treatment of amenorrhea than the solid glass stem pessary of Hepperlen. For a description of the instrument and method of use see page 187.

CHAPTER VII.

DISORDERS OF MENSTRUATION (Continued).

DYSMENORRHEA.

DYSMENORRHEA is painful menstruation. Many women suffer more or less discomfort at the menstrual period, but by common usage a dysmenorrhea is made to include only such cases as suffer to such a degree as to compel them to seek relief. For convenience of description, and for diagnostic purposes, four varieties of dysmenorrhea may be recognized: neuralgic, inflammatory, mechanical, and membranous.

Neuralgic Dysmenorrhea.—This is a local expression of the neuralgic diathesis. It depends upon general, rather than upon local, causes. It comes under conditions which predispose to neuralgias in other parts of the body, and is usually attended with the evidences of supersensitive nerves elsewhere. Examination will generally reveal cutaneous hyperesthesia, especially over the lower abdomen and spine, and tender points at the emergence of the costal nerves. Patients so affected are often anemic, hysterical, or neurasthenic, and not infrequently the victims of malaria, rheumatism, or other diseases which tend to impoverish the blood and subvert nerve-energy. The pain resembles that of neuralgia elsewhere, in that it is undulatory in character and variable as to time, duration, and intensity. It bears no fixed relation to the flow, and may precede, accompany, or follow it. It radiates from the region of the uterus to the hips, back, or thighs, sometimes girdling the pelvis.

Diagnosis.—The absence of obvious pelvic lesion; the undulatory and eccentric character of the pain; the presence of the neuralgic diathesis, as indicated by the hyperesthesia of the lower abdomen and spine; the tender points of Valleix, and occasional neuralgia elsewhere are usually sufficient to make the diagnosis clear.

Treatment.—The treatment should be on general principles, and should be systemic rather than local. Hygienic measures should take precedence. Fresh air, sunlight, out-door exercise, plain substantial food, regular hours, pleasant surroundings, and such medication as may be indicated by the underlying condition should be the *régime*. Iron, quinia, arsenic, phosphorus, and nux vomica, and other tonics

and reconstructives may be called for. Malaria, rheumatism, syphilis, or other constitutional state should be met with remedies appropriate to each. The bowels should be kept regular, and digestion aided by the use of pepsin and the diastasic malt preparations. Some cases may require the rest cure, others a change of air and scene. Many cases are intractable, and will run a course of years despite all medication.

While pursuing this general trend of constitutional treatment with a view to ultimate cure, the monthly recurrence of pain will demand palliative measures. For this purpose apiol or pulsatilla may be given in 5-minim doses three times a day, commencing one week before and continued through the period. For the immediate relief of pain, hot baths, hot applications to the hypogastrium, hot drinks, and various analgesics will be in demand. The coal-tar products, such as phenacetin or antipyrin, combined with caffeine, digitalis, whisky, or other heart-stimulant, will usually give marked relief. They should be given in doses ranging from 10 to 20 grains, and may be repeated at intervals of an hour or more, but not oftener than three or four times. Unbearable pain not amenable to other modes of treatment may require morphine hypodermically. Great circumspection should be used in the administration of opiates for this as for other constantly recurring pain, for fear of engendering the opium habit. One of the most pitiable cases of opium habit I ever knew arose in this way. Diffusible stimulants are often effective, but are open to the same objections. Finally, as a last resort, it may become necessary to terminate the suffering by removing the appendages.

Inflammatory Dysmenorrhea.—This is sometimes also known as congestive dysmenorrhea. There is much reason for believing that an inflammatory condition subtends a very large proportion, if not all the cases, belonging to this group. This inflammation may be located in the uterus, ovaries, tubes, or in the adjacent pelvic structures. As this form of dysmenorrhea depends upon an acquired condition,—inflammation,—the patient, as a rule, will give a history of normal menstruation at an earlier period of life. The pain is characteristic of inflammation, and is accompanied by a sense of soreness. It radiates in various directions. Deep pressure over the hypogastrium or through the vaginal vault often, though not always, elicits pain, the pain being proportional to the degree of pressure exercised. Febrile reaction, as indicated by accelerated pulse and increase of temperature, will be observed in a portion of the cases, but will depend

entirely on the condition of the inflammatory lesion. The woman is not well in the intervals of menstruation, and examination will reveal the evidences of pelvic disturbance. When due to tubal or ovarian inflammation, the pain is referred to one or the other iliac region. It usually precedes the flow by several days or a week. It may cease when the flow begins or continue throughout the period. A copious flow acts as a depletent and usually relieves the pain.

Treatment.—The treatment should be addressed to the causative factor, whether it be an endometritis, ovaritis, salpingitis, or what not. Uterine displacements and adventitious growths should receive attention. Free purgation and hot vaginal douches as routine measures just before menstruation serve to allay the congestion and mitigate the suffering. The patient should be put to bed and kept there during the entire period. For immediate relief resort may be had to the various measures mentioned under the head of neuralgic dysmenorrhea.

Mechanical Dysmenorrhea.—Mechanical dysmenorrhea is that form in which a mechanical impediment exists to the escape of the menstrual fluid or to its formation within the uterine cavity. The outflow of the menstrual fluid may be impeded by stenosis of the cervical canal, by sharp flexure of the uterus,—anterior and posterior,—by growths within or without the canal impinging on its caliber, and occasionally by some impediment in the vagina or its outlet. The disturbance is most frequently associated with anteflexion. Faulty development of the uterus is at the bottom of most cases. In such, a normal congestion, such as must necessarily precede and accompany the menstrual effort, is attended with suffering, because of the lack of provision for normal expansion. Exfoliation of the epithelium and rupture of the capillaries are likewise difficult and painful. Indeed, the complex of phenomena which take part in and are essential to the formation of the normal menstrual fluid are disjoined and inharmonious. The organ is imperfect and unripe, and, like the nut which casts its hull at maturity, it clings to its decidua most tenaciously before that period.

The pain of mechanical dysmenorrhea is quite characteristic. It commences insidiously, increases gradually, attains a climax, and ceases suddenly. A gush from the cervix announces the fact that the obstacle has been overcome and the uterus has emptied itself. After a respite of variable duration the pain steals on, augments, and comes to a crisis as before. The patient is not always aware of the gush from the uterus, but is generally cognizant of the fact that

an increased flow follows the paroxysm of pain. In most instances clots of larger or smaller size will be found in the discharge. These indicate textural defect of the endometrium, and point to a sparsity of the lymphoid elements, whose office it is to prevent coagulation.

As mechanical dysmenorrhea depends so frequently on faulty development of the uterus, it usually dates from the commencement of menstruation. It may, however, take its origin in a superinvolution or from a morbid growth. In time inflammatory changes are apt to supervene, when the case takes on the character of both forms of dysmenorrhea.

Treatment.—The impediments to the outflow should be removed, if possible. Morbid growths within the canal or pressing on it from without should receive attention. The bent canal should be straightened and its caliber enlarged. The developmental defects should be remedied, if possible. Forcible dilatation of the cervix meets these

Fig. 37.—Hard Rubber Graduated Dilators for Cervical Canal.

indications in large measure. It straightens the canal, enlarges its diameter, stimulates nutritive change, obtunds the oversensitive nerves, and produces an alterative effect on the endometrium. It should be done deliberately and thoroughly, and be followed by curettage and the application of carbolic acid to the endometrium. The occasional passage of the uterine sound, or, better still, the graduated dilatation and packing of the uterine canal according to the method of Vulliet, will often yield good results. Strips of gauze are introduced through the cervix into the uterine cavity. These are removed daily and replaced by larger strips until the canal becomes patulous and the cavity distended. This usually requires several weeks. The alterative effect is sometimes conspicuous. The constant electrical current is probably the most efficient agent with which to combat the mechanical dysmenorrhea dependent on faulty development, and should always be tried before resorting to any measures more radical than that of curettage. With the positive electrode

within the uterine cavity and the negative over the lumbar region, from 25 to 40 milliampères are passed. These *séances* are repeated at weekly intervals, and are of five minutes' duration. The general health should be looked after. For immediate relief such measures may be adopted as have been recommended under the head of "Neuralgic Dysmenorrhea." The antispasmodics are especially indicated, such as chloral hydrate, belladonna, stramonium, and hyoscyamus.

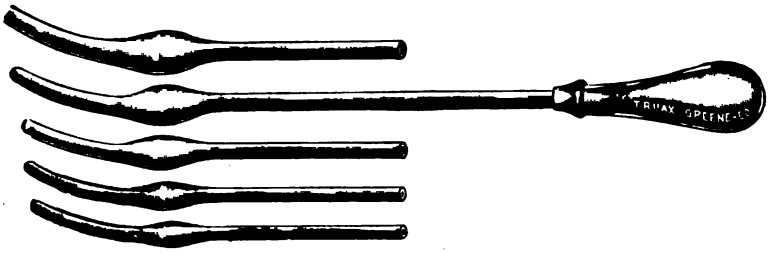


Fig. 38.—Peaslee's Cervical Dilators.

Membranous Dysmenorrhea.—The conspicuous feature of this form is the casting off of the endometrium in tangible form. The membrane is cast off in its entirety, forming a mold of the uterine cavity, or in patches of variable size. It occurs, for the most part, in the unmarried or sterile. It depends upon an inflammatory condition of the endometrium: exfoliative endometritis. The shedding and expulsion of the membrane is attended with great pain, which re-

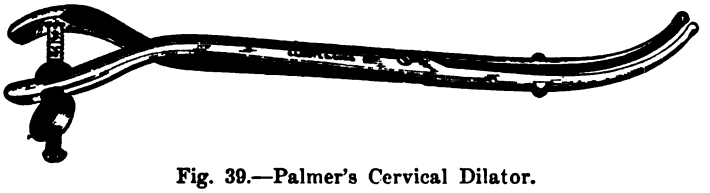


Fig. 39.—Palmer's Cervical Dilator.

sembles the pains of miscarriage. When the membrane has been expelled the pain ceases, or changes its character, and becomes greatly mitigated. Menstruation is often scant and irregular, and is not always accompanied by the expulsion of the membrane. Sometimes the membrane is expelled at alternate periods or at longer intervals. Abortion at the menstrual period may be mistaken for membranous dysmenorrhea, especially if habitual and in the early stages. It is seldom, however, that a woman will abort so habitually and through

so long a period as to cloud the diagnosis. The dysmenorrheal membrane, moreover, is wanting in the large, irregular cells of the decidua, as revealed by the microscope.

Treatment.—The treatment consists of curettage and applications of iodine or carbolic acid to the endometrium. These may have to be repeated a number of times. Electricity in the form and administered in the manner spoken of under the head of "Mechanical Dysmenorrhea" will be found of great value. The general health should receive attention. The disease is obstinate and will require much time and patience to overcome.

A STUDY OF DYSMENORRHEA.

I have given the above classification of dysmenorrhea in deference to prevailing views, and because it serves a practical purpose in differentiation and treatment. Strictly speaking, there are but two forms of dysmenorrhea: neuralgic and mechanical. Careful analysis will show that most, if not all, dysmenorrheal subjects are neurotic, the neurotic impress being manifest in other ways than in painful menstruation. In some the neurotism is acquired; in others it is inherent and perpetual. Engelman, after an extensive investigation embracing in its scope upward of 5000 school-girls, found that a large proportion of such were the subjects of dysmenorrhea, and that the intensity of suffering bore direct relation to the work and worry of student-life. The vacational period brought marked relief to the majority and complete relief to many. The mechanical obstacle to menstruation is not confined to the uterine orifice, as taught by Sims, but takes a much wider range. It is found in the endometrial epithelium, in the terminal vessels, in the structure of the uterine walls, and in the structural changes incident to inflammation or other morbid processes. It is also dominated by nerve-influence.

In normal menstruation there is provision and preparation for the act, that all things may work in harmony and without violence. The ripe fruit falls of its own accord, the green fruit holds tenaciously to its stem. The exfoliation of the endometrial epithelium at stated intervals is physiologic: it disintegrates and drops off as the hairs from the head. The decidual teeth of the infant and the skin of the serpent are thrown off with ease, because they have served their purpose and are prepared for the change. Under normal conditions and at the proper time the endometrial epithelium becomes detachable, and, having lost its cohesiveness, is pushed off by the capillary effusion beneath it.

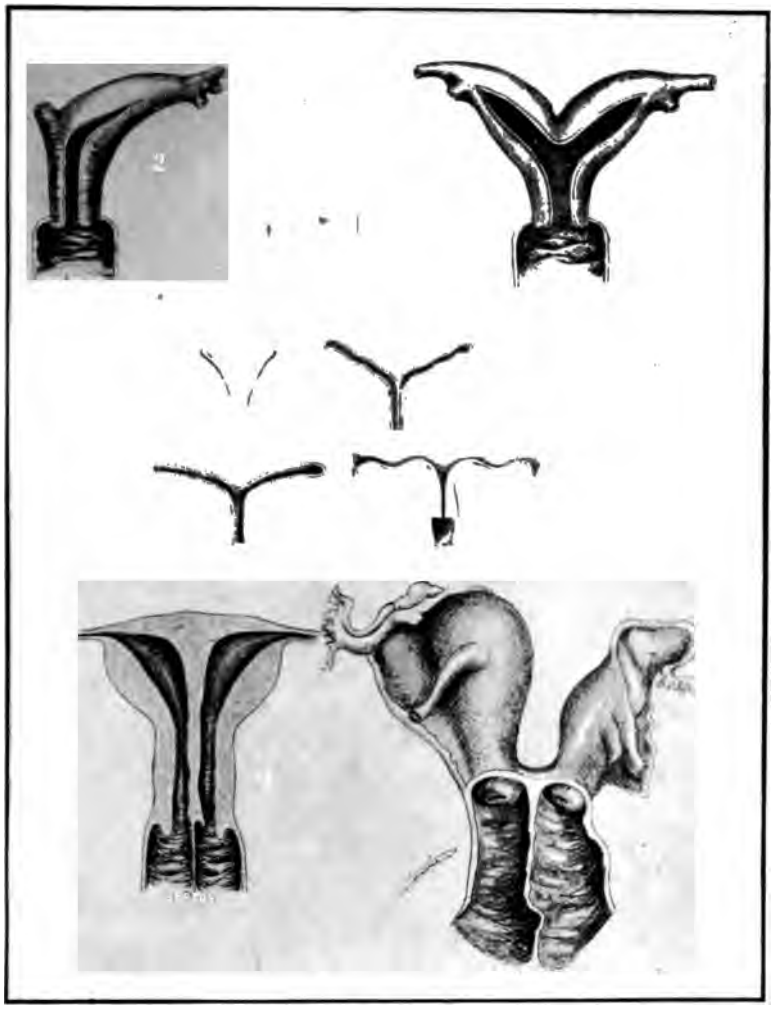
There are grounds for believing that the pain of dysmenorrhea, in many instances at least, is due to intramural blood-pressure, either by reason of the tenacity of the epithelium, undeveloped terminal vessels, or rigid, unyielding walls. All these conditions are obstructive, and evidences of defective development or perverted metabolism. It is not improbable that the inflow is sometimes obstructed by spasmodic contraction of the vessels or the tissues traversed by the vessels under the influence of a perverted nervous energy. I am persuaded, furthermore, that quite frequently the trouble is situated at the os internum; not as a mechanical obstruction *per se,* but in the form of an orificial irritation which may produce spastic and other reflex phenomena, such as are found in vaginismus and irritable bladder. This may consist of either simple hyperesthesia or a lesion, as in fissure of the anus. Certain it is that in many of the dysmenorrheal cases the internal os is found exquisitely sensitive to the passage of the sound. The effect of full dilatation on such cases would be most salutary.

Membranous dysmenorrhea is mechanical in that it offers an impediment to both the inflow and outflow of the menstrual fluid. Inflammatory conditions may render painful the normal turgescence of the organs concerned in menstruation, and interfere with those changes incident to the menstrual effort. The tissues concerned are erectile in character, and must of necessity undergo changes of size, shape, and position when filled with blood. The male penis, as one of the most conspicuous examples of an erectile organ, affords an apt illustration of the effect of restraint under erection: held down by a chordee, the act of erection is attended by excruciating pain. The tubes and ovaries bound down by adhesion or splinted by interstitial deposits are liable to give rise to a sense of discomfort, if not actual pain, under the engorgement of menstruation. What is said of the adnexa will apply to the uterus. But the basic factor of dysmenorrhea lies under all of this, and is to be sought for in the nervous system. That inflammation of the genital tract, in whole or any part of it, is not of itself sufficient to cause dysmenorrhea is evidenced by the fact that many—I might say most of—such cases are unattended by painful menstruation. The same may be said of the conditions found in the so-called mechanical dysmenorrhea. Some of the most pronounced cases of flexion of the uterus that I have ever seen have been free from dysmenorrhea; some of the narrowest canals, some of the most clotted discharges. Even instances of complete atresia of the genital tract are at times comparatively free from pain at the

menstrual molimen, and seldom the cause of such suffering as we find in aggravated cases of dysmenorrhea.

In the dysmenorrhea of anteflexion Schultze has introduced the uterine sound during the paroxysm of pain which immediately precedes the flow and which has been supposed to be due to the efforts of the uterus to expel the accumulated blood within its cavity, and found no blood in the cavity. The pain was evidently due to a mechanical obstruction farther back, or a nerve-storm, which, for the time being, prevented the inflow of blood. When the obstruction was overcome, or the storm abated, the blood made its appearance and immediately found an outlet through the cervical canal. Then, again, in many—very many—cases of dysmenorrhea I have found the cervical canal more than ordinarily patulous. We must conclude, then, that a supersensitive condition of the nerves is the basic factor of dysmenorrhea. This is sometimes associated with an inflammatory condition or mechanical obstruction which may modify or even intensify the trouble. We find somewhat analogous conditions in other hollow organs or their outlets. In that painful, spasmodic condition of the introitis vaginæ, known as vaginismus, we are frequently unable to find any lesion. In some instances of irritable bladder or irritable rectum nothing tangible can be found. Yet forcible and thorough dilatation will oftentimes bring about such changes in each as to be followed by amelioration, if not positive cure. It is to be hoped that, with a more correct knowledge of the pathology of this distressing malady, improved methods of treatment may give better assurance of success.

PLATE V.



Development and Malformations of the Genital Apparatus.

1. Stages of development.
2. Uterus unicornis.
3. Uterus bicornis.
4. Uterus septus.
5. Uterus duplex.

CHAPTER VIII.

MALFORMATIONS OF THE GENITAL TRACT, STERILITY, ETC.

MALFORMATIONS.

THESE are considered *seriatim* for the reason that they are so intimately associated and arise for the most part from the defective development of the primitive system from which the genital organs are formed. Occasionally, though rarely, there is a complete absence of one or more of the genital organs, or they may be so imperfectly developed as to be of no functional value.

The ovaries, as the essential organs of generation, are almost never entirely wanting, but at times are so imperfectly developed as to be recognizable with difficulty. The same may be said of the uterus. Abnormalities of the uterus and vagina can be best understood by reference to their manner of development. In the early weeks of embryonic life two little tubes come down from above—one on either side—and terminate at what is to be the vaginal orifice. From these tubes (Müller's ducts) the Fallopian tubes, uterus, and vagina are formed. At first they are widely separated from each other above, and approximated at their inferior extremities so as to resemble the letter V. A little later the lower segments approximate each other and lay side by side, while the upper segments are divergent. They now resemble the letter Y. Still later the upper segments fall away from each other and assume a position at right angles to the united ducts below. It now resembles the letter T. The horizontal arms of the T represent the Fallopian tubes, and the vertical stem the uterus and vagina. (Fig. 1, Plate V.) In the process of normal development that part of the ducts which is to form the uterus and vagina become fused, the partition wall disappears, and the two ducts become one. At the same time they enlarge rapidly, and the segment which is to form the uterus becomes greatly thickened.

The malformations of the uterus and vagina arise from some defect in the developmental process, and consists, for the most part, in a failure of the two ducts to fuse or in a persistence of the partition wall between them. Thus, in the event of a complete failure of the two segments to unite there results two bodies, each of which is supplied with a Fallopian tube, and, though misshapen, possesses all the

essential characteristics and functions of a uterus. This gives us the double uterus: *uterus duplex.* (Fig. 5, Plate V.) When the lower segment of the uterus is fused and the upper part divergent the result is a double-horned uterus: *uterus bicornis.* (Fig. 3, Plate V.) When the two lateral segments of the uterus are united throughout, but the septum, or partition wall, remains, the result is the two-chambered uterus: *uterus septus.* (Fig. 4, Plate V.) When only one of the lateral segments of the uterus develops and the other remains rudimentary, the result is the one-horned uterus: *uterus unicornis.* (Fig. 2, Plate V.)

The vagina is sometimes absent, sometimes rudimentary, and sometimes double. Occasionally there are transverse septa, and rarely it is one-sided, owing to the fact that only one of the lateral ducts develops. The anomalies of the vagina are to be explained in the same way as those of the uterus. A double vagina may or may not co-exist with a double uterus or any of the malformations of that organ, and *vice versa.*

Hermaphrodism.—Hermaphrodism is a combination of the essential organs of generation of both sexes in the same individual. By the essential organs are meant the ovaries and testicles. The external organs of generation are never perfect under the circumstances, and it is seldom that the ovaries and testicles are. Not infrequently one or the other of the latter is wanting even in recognized hermaphrodism. Perfect hermaphrodism, in the sense that both sexes are represented in the same individual by a complete and perfect development of all the organs of generation, does not exist. Indeed, there is much diversity of opinion as regards true hermaphrodism, and the subject may be very properly relegated to the literature of medical curiosities. Writers have classified hermaphrodism according to the disposition of the essential organs of generation. A very simple and comprehensive classification is as follows:—

1. Bilateral, where an ovary and testicle are present on both sides.

2. Unilateral, where an ovary and testicle co-exist on one side only.

3. Lateral, where the ovary and testicle are on opposite sides.

Pseudohermaphrodism is much more frequent than true hermaphrodism. It comes from defective development of the external organs of generation, often associated with bodily conformation that renders the determination of the sex difficult. Thus, the external genitals of the male may approximate those of the female in appear-

ance and arrangement. The mammary glands may develop. He may be beardless, and possess, in a measure, the physical conformation, the voice, and manners of the female. An undeveloped penis, cleft scrotum, hypospadias, and non-descent of the testicles may easily be mistaken for the genital apparatus of the female, especially by the uninformed. On the other hand, the female may approximate the male in type. She may have the form and carriage of a man, and she may have a well-developed beard. The clitoris may be largely developed, the labia may be agglutinated, and the ovaries may have descended into the labia, thus simulating the penis, scrotum, and testicles. The diagnosis is oftentimes difficult and sometimes impossible during the life of the individual. Careful examination of the whole genital apparatus, supplemented by microscopic examination of the secretions for spermatozoa, will usually lead to a determination of the sex. In the absence of positive proof it is better to regard the subject as a male, both for the moral effect and because anomalies of this kind are more frequent among males than females.

STERILITY.

Sterility implies the inability to bring forth a living child at term. Some women never conceive; others conceive, but are unable to carry the child to a viable age; while others still have given birth to one or more children, but have ceased to be fruitful. The essentials to a fruitful intercourse are that the spermatozoid and the ovule should be brought together and that each should be endowed with its physiologic attributes. The uterine cavity is the meeting-place of the sperm and germ-cell, and each has a long journey to make before arriving there. This journey is oftentimes beset with difficulties and dangers, and even under ordinary conditions many ovules and vast numbers of the spermatozoids perish before arriving at their destination. To recite in detail all the causes and conditions which may subvert this union of the male and female elements would require more space than can be allotted to the subject in this connection. A little reflection will suggest to the reader many ways in which this chain of co-ordinate conditions may be broken and the object of it all defeated.

On the part of the woman the ovule may not have been formed. This may come from want of development, or from some diseased condition of the ovaries, inflammatory or neoplastic. Sarcoma of the ovary always destroys the ovule. The ovary may be so imbedded in inflammatory or other products, or the covering may have become

so dense, as to prevent the extrusion of the ovum. The Fallopian tube may be so bound down or distorted by adhesions as to prevent its taking up the ovum when extruded from the ovary. The tube may be sealed at one or both extremities; it may be angulated or splinted, deprived of its epithelium, or degenerated. The uterus may offer no fit asylum for the ovum by reason of developmental defects, morbid growths, or—more frequently still—because of inflammatory changes. The secretions of the uterus are at times poisonous to the ovum, and there are reasons for believing that the same condition may obtain in the tubes. The condition of the endometrium is probably the most essential single factor in the production of sterility. It is here that the ovum finds its resting-place and from which it draws its sustenance. It is from this that the maternal placenta is formed; hence it is essential that it should not only be in a condition to receive the ovum, but that it should actively co-operate in its development.

Mechanical obstacles to the entrance of the spermatozoa are frequently adduced as causes of sterility. These consist in flexure of the uterine canal, elongated and conical cervix, malposition of the uterus, and breaks in the pelvic floor. I cannot believe that these, as a rule, are operative. A canal through which the menstrual fluid will pass, or which will admit the uterine sound, will hardly offer serious obstacle to the transit of a body the one six-thousandth of an inch in diameter. While admitting that such conditions are very frequently associated with sterility, and especially the flexures of the canal and conical cervix, I am disposed to regard these as indices of developmental defects existing in the endometrium or elsewhere which are in themselves serious obstacles to conception. Indeed, I have known women to conceive under every phase of the so-called mechanical obstacles usually ascribed as causative factors of sterility. It should not be forgotten, however, that an absolute occlusion of the cervical canal may exist, which will effectually bar the entrance of the spermatozoa, and yet offer no obstacle to menstruation or the passage of the sound. A pinhole os may be plugged with mucus or a fold of mucous membrane may block the os internum. These are easily pushed aside by the sound or by the outflowing tide of menstrual blood, whereas a spermatozoid or an army of them could not push aside a film of gold leaf suspended in the way.

The uterine or vaginal secretions may injuriously affect the spermatozoa—sometimes killing them outright. In many instances of sterility, where no gross lesion exists, the cause, as I believe, will be

found in the expulsion of the semen by vaginal contraction immediately after it has been deposited therein. I have elicited this history from a great many women whom I have questioned in regard to it, and have come to regard the "spitters" as the most unpromising subjects for treatment.

The general health of the patient occasionally plays a rôle in the production of sterility. Syphilis, gout, or rheumatism, and many other conditions which produce a dyscrasia or seriously affect the general health are at times the responsible factors. Syphilis is particularly inimical to fetal viability, even though conception takes place. Women will sometimes conceive for one man and not for another. It should not be forgotten that the husband may be at fault. This occurs in about one-tenth of the cases of sterility. No examination should be considered complete in the absence of tangible evidence of sterility in the female until the semen of the husband has been subjected to microscopic inspection.

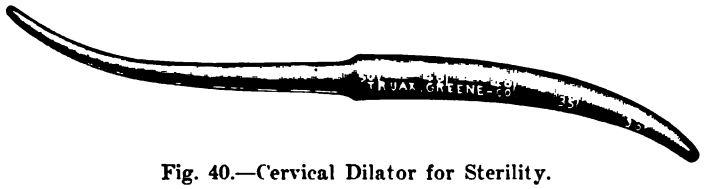


Fig. 40.—Cervical Dilator for Sterility.

Prognosis.—The prognosis will depend upon the cause, whether it be recognizable and remediable. On the whole, it is rather favorable. The number of women who remain sterile throughout the entire period of an average married life is comparatively small. A canvass of communities will bear out this statement. Many women after long years of sterility become fertile, and not infrequently give birth to several children in succession.

Treatment.—A careful consideration of all the conditions conducive to sterility should govern the diagnosis, and the diagnosis should dictate the treatment. Obvious causes should be removed if possible. Inflammatory conditions should be corrected, adventitious growths and products removed, malpositions rectified, the elongated cervix amputated, and the uterine canal straightened. The two latter, while not recognized as being in themselves prime factors, are often by their correction instrumental in bringing about other changes that are of actual benefit. The general health should be looked after and special conditions met with appropriate remedies. Syphilis, lithemia, and excessive obesity should be treated *secundem artem.*

There is reason to believe that the psychical effect of local treatment is sometimes efficacious, inasmuch as women, long barren. will sometimes conceive soon after commencing a course of treatment. Patient perseverance in remedial measures throughout months and years will oftentimes be rewarded with success.

SUBINVOLUTION OF THE UTERUS.

This is the result of an arrested involution of the uterus after it has expelled the products of conception. It may occur after a miscarriage or labor at term. The retrogressive changes by which the organ is restored to something like the virginal type are interfered with and the organ remains large and boggy. Being heavy and soft, it settles in the pelvis or topples over backward. It is sometimes sharply flexed. As the ligaments, adnexa, and vagina participate in the subinvolution, displacements of the uterus are rather favored than opposed. The endometrium is thick, succulent, and thrown into folds. Glandular endometritis is common. In fact, the subinvolution is, in all probability, due to a low grade of infection,—septic or specific,—which in most instances has its origin in the endometrium. A lacerated cervix or broken pelvic floor may furnish the avenue of infection. Histologically, the subinvoluted uterus is found to consist of enlarged blood-vessels, nerves and lymphatics, hypertrophied muscle-fibers undergoing fatty degeneration, and glandular hypertrophy of the endometrium. Should the condition persist, connective tissue growth supplants the normal histologic elements, and the organ becomes permanently hypertrophied.

Symptoms.—The woman complains of a weight and bearing down in the pelvis and usually of backache. There may be systemic evidences of infection, such as loss of appetite, costiveness, anemia, and malaise. Occasionally she is depressed and melancholic. Menorrhagia is the rule in menstruating women, and leucorrhea is seldom absent.

Diagnosis.—The diagnosis is made by finding the enlarged, boggy uterus in a woman who dates her illness from the date of confinement in the not too distant past.

Treatment.—The object of treatment should be to correct existing lesions, restore the uterus to position, and stimulate metabolism. The uterine cavity should be explored and relieved of fetal *débris*. The uterus should be brought into position and kept there. The lacerated perineum and cervix repaired. The general system should be built up by proper hygienic and medicinal measures. Iron, qui-

nine, strychnia, and various other alteratives and tonics may be used to advantage. The preparations of ergot are especially indicated for their specific influence in producing uterine contraction. The local treatment consists in applications of tincture of iodine to the uterine mucosa or vaginal vault once or twice a week, followed by the boroglycerid tampon and ichthyol. Hot vaginal douches should be taken by the patient morning and evening. As a *dernier ressort,* amputation of the cervix may be resorted to in the hope that in this condition, as in others, atrophic changes will take place in the uterine body.

SUPERINVOLUTION OF THE UTERUS.

This is the reverse of subinvolution. Here the involution of the uterus does not stop at the normal stage, but continues until the organ is reduced much below the normal in size. Superinvolution, like subinvolution, affects the entire generative apparatus, including the ovaries. The affection is happily rare, as the results are often most distressing and the disease not amenable to treatment.

The causes are not known, but the condition has been found to follow excessive loss of blood at confinement, overlactation, and inflammatory conditions of the adnexa. The symptoms are amenorrhea, or, if menstruation persist, a most inveterate and hopeless form of dysmenorrhea. There is usually much disturbance of the nervous system. Hysteria and neurasthenia are common. The diagnosis is made by finding the undersized uterus in a woman who has born children.

Treatment.—Treatment is usually unavailing. Build up the general system and apply electricity locally. In aggravated cases the only relief lies in inducing the artificial menopause by removing the uterine appendages.

CHAPTER IX.

DISEASES OF THE VULVA.

HYPERTROPHY.

ANY or all of the anatomic divisions of the external genitals may become hypertrophied. The parts most frequently affected, however, and for which the physician is most frequently consulted, are the nymphæ and clitoris. The causes of this condition are not well understood. Moderate degrees of hypertrophy have been ascribed to local irritation, such as would arise from masturbation, excessive venery, or even the rubbing incident to a pruritus. The most notable examples of overgrowth of the nymphæ are found among the Hottentots and kindred tribes of South Africa. Here the nymphæ attain an enormous development, not infrequently extending down the thighs even to the knees. Such a development is regarded as a mark of distinction, and it is said that the growth is encouraged by systematic stretching and massage from infancy. It is probable, however, that culture has not so much to do with the excessive growth as racial peculiarity. The clitoris sometimes becomes unduly enlarged, even to the size of the penis of a half-grown boy. Both conditions may give rise to inconvenience because of their bulk and by interfering with urination or copulation. Owing to their exposed and unprotected state they are subject to unnatural irritation, and may become inflamed or ulcerated. The only remedy is amputation, with coaptation of the cut edges by suture to guard against hemorrhage and insure speedy union.

ADHESIONS OF THE LABIA.

This is principally an affection of infancy and childhood, and depends upon a softened or immature condition of the epithelium, with consequent agglutination. It frequently arises from uncleanliness. It seldom gives rise to inconvenience in early life, but may at a later period by interfering with the uterine or vaginal discharges and possibly with sexual relations.

Treatment.—As the union is not firm, all that is necessary, as a rule, is to get the patient in position and by pressure of the two thumbs in opposite directions break up the adhesions. Should it not yield to this, a bent probe introduced through the small opening

which usually exists immediately beneath the urethra and forcibly withdrawn in the line of cleavage will generally suffice. Should there be no opening under the urethra, it is better to wait until menstruation has declared, and then deal with the case as with an imperforate hymen. After separation of the labia, the opposing surfaces should be kept from coming in contact by pledgets of gauze until they are healed.

VULVITIS.

Vulvitis is an inflammation of the vulva. There are three varieties: simple, purulent, and follicular.

Simple Vulvitis.—Simple vulvitis is, for the most part, the result of local irritation, and has its origin in filth and vicious habits. The most common causes are acrid discharges from the uterus and vagina, accumulated filth, decomposing secretions, parasites, and mechanical irritation, such as scratching, rubbing, friction to allay itching, or for the purposes of masturbation. The parts are red, swollen, and bathed in a watery or mucous discharge. The symptoms are a sense of fullness, itching, and burning.

Purulent Vulvitis.—Purulent vulvitis is characterized by a purulent or muco-purulent discharge. It is usually the result of gonorrheal infection. It may arise from a neglected simple vulvitis which has become infected. The redness and tumefaction are, if anything, more pronounced than in the simple variety. Patches of erosion and ulceration of the inflamed surfaces are not uncommon. In such instances the discharges are apt to be tinted with blood. The perineum and inner aspect of the thighs occasionally participate in the inflammatory reaction and become excoriated. This is due principally to the irritating discharges. The symptoms are those of the simple variety intensified, though in the young or impressionable the local trouble may be supplemented by some febrile reaction.

Follicular Vulvitis.—Follicular vulvitis differs from the other varieties in that the follicles are involved. It arises from the same causes, and may or may not be associated with either of the other varieties. In some instances the follicles stand out conspicuously as elevated red points. In such the diagnosis is easily made. In others the diffuse redness and tumefaction obscure this feature. Usually palpation and careful inspection will disclose the enlarged follicles, from which can be expressed the muco-purulent or purulent contents. The surfaces of the labia are besmeared with the discharge. The causes and symptoms are those of the other varieties.

Vulvitis sometimes occurs in girls or very young children. It may be the result of uncleanliness or of specific infection. Ill-nourished and neglected children, especially those of strumous habit, are prone to it. It occurs in such more frequently in hot weather. Gonorrheal vulvitis sometimes occurs in epidemic form where girls

Fig. 41.—Follicular Vulvitis.

are aggregated under one roof, as in boarding-schools. The infection is conveyed from one to another through towels, bedding, and other articles of common use. Vulvitis in a child will often awaken the suspicions of the parents, and as a consequence wrongful accusations are occasionally made. As the physician is likely to be consulted, great care should be exercised lest injustice be done the accused.

Treatment.—Much of the treatment will apply to all three varieties. The essential features of treatment are to remove the cause, establish and maintain cleanliness, and protect the parts from irritants and acrid discharges. These, in the majority of instances, will be followed by speedy relief, but may be reinforced by soothing applications, germ-destroying agencies, and measures of relief for the overdistended follicles. The result, as a rule, does not depend so much on the variety of remedies as upon the diligent use of a few appropriate ones. For cleansing purposes, vaginal douches, sitz-baths, and local bathing may be used. The water should be comfortably warm, and may be plain or medicated by the addition of common salt, boric acid, or the sugar of lead in the proportions of 1 to 100. A 2-per-cent. solution of carbolic acid or nitrate of silver may be used as a local application, as also a 1 to 2000 solution of bichlorid of mercury in obstinate cases or those of specific origin. The douching and bathing of the parts should be repeated several times in the twenty-four hours, or as often as need be to maintain cleanliness. Protectives may be applied in the form of ointment or powder. The oxid of zinc ointment serves the purpose admirably, as also a powder composed of equal parts of bismuth and chalk. Pledgets of gauze, dry or medicated, should be kept between the inflamed surfaces to prevent contact. In the follicular variety it may be found necessary to relieve the follicles by puncture, and, after expressing the contents, to cauterize with nitrate of silver or carbolic acid.

INFLAMMATION OF THE VULVO-VAGINAL GLANDS.

This is usually the result of septic or specific infection. It is highly suggestive of gonorrhea. The duct is frequently affected to the exclusion of the gland. It is indicated by slight tumefaction and tenderness over the course of the duct, and by a reddened orifice. The secretion is increased, and consists of mucus or pus. The duct may be occluded, thereby causing a retention cyst. When the gland is involved it becomes enlarged, tender, and exquisitely painful. It forms a distinctly circumscribed tumorous projection on the inner aspect of the lower half of the labium. If suppurating, pressure over the gland will cause pus to exude and discharge through the duct. Occasionally the duct becomes permanently occluded, and may, in consequence, become greatly distended. (Fig. 42.) This is accompanied by intense pain, but usually sooner or later the accumulated pus finds vent through one or more ulcerated openings below the orifice. Many cases recover spontaneously or as the result of medica-

tion. Others continue until relieved by surgical intervention. As a rule, only one side is affected at a time.

Treatment.—Rest in the recumbent position, attention to the bowels, soothing and anodyne applications to the inflamed area, and an occasional emptying of the gland by gentle pressure will fulfill the indications in the majority of cases. Should suppuration persist, the

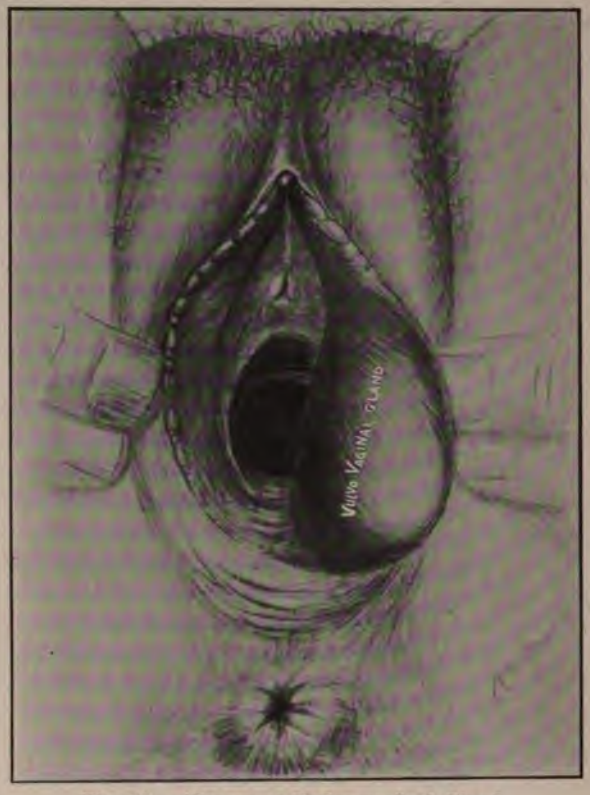


Fig. 42.—Abscess of Vulvo-vaginal Gland.

duct become occluded, or fistulous tracts form, the gland should be laid open by a free incision, thoroughly curetted and swabbed with pure carbolic acid or a 1 to 1000 bichlorid solution, and packed with gauze. Should the condition indicate much disorganization of the gland, it should be removed either in its entirety by careful dissection or taken away piecemeal by means of curved scissors and tissue forceps. The cavity may be packed with gauze and allowed to heal

by granulation, or, if healthy, closed at once by suture. When the duct is affected, either alone or in conjunction with the gland, an attempt should be made to open it up by a delicate probe, followed by an application of carbolic acid or bichlorid. Should this fail, it may be laid open with scissors and cauterized or dissected out.

CYSTS OF THE VULVO-VAGINAL GLANDS.

These are due to the retention of the contents, and are usually the result of a pre-existing inflammation. They occur under two conditions: First, and most usually, from occlusion of the duct, and, second, from an increased consistence of the contents which precludes their escape through the normal passage. The contents are clear, more or less viscid, and yellowish, or of chocolate color. Cysts may be situated either in the gland or the duct. They are seldom larger than an egg, but may attain the size of the fetal head. They are tense and elastic and usually insensitive. They are located on the lower and inner aspect of the labium. They are to be differentiated from hernia, hydrocele of the canal of Nuck, and other cystic formations along the course of this canal. These latter occupy the upper and outer aspect of the labium, and can be traced to the inguinal ring. If the contents of the cyst be not too viscid, the hypodermic syringe will reveal its character.

Treatment.—The contents of the cyst may be aspirated and the sac injected with tincture of iodine, carbolic acid diluted with alcohol, or a 1 to 2000 solution of bichlorid of mercury. The cyst need only be partially filled with the medicament, which after thorough massage may be withdrawn again. If this fail, the cyst should be extirpated.

EXANTHEMATA OF THE VULVA.

The vulvar integument is subject to the same affections as the mucous and cutaneous surfaces elsewhere. They are produced by the same general causes, present the same features, pursue a similar course, and are amenable to like treatment. Among the most common of these are herpes, eczema, and prurigo. Their recognition is important as indicating the line of treatment, and to prevent their being confounded with some other form of disease. The large, raw, circular abrasion of a burst herpetic vesicle has been frequently mistaken for a chancre or chancroid. The absence of a hardened base and the slight involvement of the inguinal glands, together with its evanescence, will serve to distinguish them. Eczema may assume any

of the multifarious forms that characterize it elsewhere. It is often grafted on, or follows in the wake of, vulvitis, pruritus, parasitic and other affections of the vulva that are characterized by itching and lead to rubbing or scratching of the parts. In seeking for the cause of any of these affections, the local conditions, such as acrid discharges, diabetic or dribbling urine, vicious habits, and personal uncleanliness, should be taken into account. The graver affections—erysipelas and diphtheria—are happily rare, and are usually the concomitants of the puerperal state.

PRURITUS VULVÆ.

This, as the name implies, is an itching of the vulva. The term is not usually applied to the inflammatory or eruptive affections of the vulva which are attended by itching, but is restricted to an intense and persistent itching of the parts unattended, especially at the outset, with any definite lesion. As a result of the friction and scratching of the parts, it may merge into one or the other conditions above mentioned. The causes are many and varied, and not always recognizable. Among the most common are acrid discharges from the uterus or vagina, which will include the discharges from malignant growths, diabetic urine, or urine that has been rendered irritating from an abnormal increase of its salts, the gouty or rheumatic diathesis, and decomposition. Thread-worms from the bowel will sometimes cause it in children. Pelvic inflammation, tumors, and pregnancy, by interfering with the circulation and by reflex nervous influence, may produce it. Local irritation from ill-fitting clothes, masturbation, and excessive venery are occasional factors. Habitual constipation sometimes acts as an exciting cause. The itching is usually most pronounced in the region of the vestibule, and is often confined to a limited area. It is usually intermittent, intense, and insufferable, driving the patient to seek relief by rubbing and scratching, regardless of time and place. As a result, she eschews all social gatherings, becomes a recluse, and in the seclusion of her home seeks relief in the most potent anodynes. If young, she is in great danger of acquiring the habit of masturbation.

The continual friction of the parts usually results in abrasions of the surface or an actual eczema. The disease spreads, involving the labia, perineum, anus, inner aspect of the thighs, lower abdomen, and vagina. Especially is this liable to be the case in pregnant women. The condition is aggravated by anything that will produce local congestion: undue exercise, sexual intercourse, stimulants, over-

feeding, and the warmth of the bed. It is common for women to suffer after retiring, and in consequence their rest is broken and they become correspondingly debilitated. The prolonged and intolerable annoyance, the loss of sleep, the seclusion, and the keen sense of her position, in the worst forms of the trouble, render the patient morbid and sometimes drive her to the verge of insanity. Fortunately, all cases are not so severe, and many never attain to a degree of severity to appreciably affect the health or spirits. In the earlier stages there is often no appreciable lesion, or at most a little puffiness and glazing of the surface; but sooner or later, as the result of scratching, the parts become indurated, thickened, dry, and discolored, with patches of excoriation and scars.

Treatment.—A painstaking search should be made for the cause, which should be removed if possible. In the majority of instances the trouble comes from a secretion from the uterus or vagina. Oftentimes the vaginal secretion is very scant and scarcely recognizable. It is, nevertheless, very acrid, and will provoke and perpetuate the trouble until shut off. As a routine measure, in the absence of other obvious cause, it is good practice to prevent the vaginal secretions from coming in contact with the vulva. This may be accomplished by a tamponade of wool or cotton. A roll or ball of either, just sufficiently large slightly to distend the vagina, is introduced, after washing away the secretions, and allowed to remain from six to twelve hours, when it is removed, the vaginal secretions washed away by a hot vaginal douche, and replaced by another. The tampon should have a string attached to it to facilitate removal, and the patient should be instructed how to prepare and introduce it. If the urine contains sugar, as is often the case with elderly women, or if it possesses irritating properties from any other cause, care should be taken in voiding it, and the parts should be bathed after each urination.

Coincident with this protective *régime* the underlying pathologic condition, whether it be general or local, should be receiving appropriate treatment. The local measures so far have been with a view to securing cleanliness. It may be necessary to use protectives to the surface, as in cases of incontinence of urine. Here, a bland and soothing ointment will be of great benefit, or ointments containing antipruritic ingredients. The carbolated, or benzoated oxid of zinc ointments, or, better still, the common white lead paint laid on with a brush, form excellent protectives. Ointments, however, are dirty and difficult to remove, and should not be resorted to except where it is necessary to protect the surface from dribbling or constant discharges.

Occasionally dusting-powders are equally serviceable, and possess the advantage of being more cleanly. Oxid of zinc or bismuth, or either combined with chalk, make efficient applications. The number of local applications which have been suggested for pruritus vulvæ is beyond enumeration. All of the anodynes, all of the so-called anti-pruritics, have been recommended and tried in turn. Among the most common are opium, chloroform, hydrocyanic acid, menthol, antipyrin, cocaine, iodoform, and bichlorid of mercury. A solution of the bichlorid of mercury varying in strength from 1-2000 to 1-500 is probably the most generally useful local application. It should be prepared fresh, as it soon loses strength if allowed to stand. A solution of nitrate of silver, 10 to 40 grains to the ounce, applied to the parts with a camel's-hair brush, often affords relief. It is almost a specific in the vaginal pruritus of pregnancy. One grain of bichlorid of mercury to 1 ounce of the emulsion of bitter almonds makes an elegant and highly satisfactory application.

In the senile form, especially in inveterate cases, lime and sulphur in solution, or in the form of an ointment, will sometimes succeed where other measures fail. Tait gives the following formula:—

℞ Calcis . . . . . 1 pound.
Sulphur . . . . . 2 pounds.

Put into three gallons of water and boil down to a gallon and a half. Use locally.

In cases that are not amenable to other treatment, it has been proposed to dissect away the affected mucous membrane.

KRAUROSIS VULVÆ.

This is a vulvar sclerosis, and in many of its aspects resembles trachoma of the eyelids. It is characterized in its initial stage by enlarged capillaries, a small round-cell infiltration of the subepithelial structures, and epithelial growth. Later the parts become bloodless, shrunken, dry, and friable. It first affects the labia minora or the parts adjoining, the primary indication being delicate red lines or spots,—the distended capillaries,—which shift from place to place, being followed by unnatural paleness, hardness, and contraction of the tissues. In time the entire mucous and cutaneous coverings of the vulva become involved, and the vulvar opening greatly contracted. The tissues become unyielding and brittle. Attempts at dilatation are exceedingly painful, and result in fissures similar to those of chapped hands. There are ordinarily no subjective symptoms except the pain

attendant on sexual intercourse or attempts at dilatation. The sexual relations, in time, become impracticable. The disease is frequently preceded and sometimes accompanied by an obstinate pruritus. The course of the disease is slow and progressive and the prognosis as to cure is unfavorable. It has no tendency to a fatal issue, and does not affect the general health.

On the assumption that the disease is a veritable trachoma, Dr. Arthur Johnstone recommends the yellow oxid of mercury ointment of the strength of from 1 to 3 per cent. The vulva and vagina are first cleansed with the hydrogen dioxid spray, and the ointment applied twice a week. The patient is instructed to use the same twice daily to the external parts. After marked improvement the applications are made at longer intervals, but should be kept up for months. To be of much benefit the treatment should be commenced early. Hot sitz-baths, or fomentations to the vulva, followed by thorough drying and the application of a powder consisting of salicylic acid and calomel, in the proportions of 1 to 5, may be of service. Strong carbolic acid has been used as a palliative. Excision of the affected parts followed by suturing has, on the whole, yielded better results than any other line of treatment.

CHAPTER X.

DISEASES OF THE VULVA: SPECIFIC, MALIGNANT, AND TRAUMATIC.

SPECIFIC DISEASES OF THE VULVA.

These are the result of gonorrheal or syphilitic infection, and occur in the form of diffuse inflammation, gonorrheal vulvitis, vegetations, mucous patches, gummata, the syphilitic eruptions, chancre, and chancroid. Gonorrheal vulvitis has already been alluded to. Venereal warts consist of papillomatous excrescences of irregular

Fig. 43.—Venereal Warts of Vulva. (Author's Case, from Photograph.)

shape and distribution. (Fig. 43.) They are found about the vulva, perineum, and anus. They are the result of irritating discharges, and, while highly significant of specific infection, they may sometimes arise from other causes. They produce an ill-smelling acrid secretion that spreads the disease.

Treatment.—The essentials of treatment are to keep the parts clean and dry. The vagina should be washed out frequently. Cloths wrung out of hot water should be applied to the vulva several times a day, for a period of from ten to twenty minutes. The parts should

be then bathed in the mercuric bichlorid solution (1 to 2000) and thoroughly dried. And, last, a powder consisting of equal parts of calomel and salicylic acid dusted over the parts. This should be repeated two or three times in the twenty-four hours. Diligence and perseverance are necessary to success, and the treatment must be followed up until the last vestige of the trouble has disappeared. Since adopting the above treatment I have had scant occasion to resort to the knife or scissors. Nevertheless, should the circumstances of the patient be such as to preclude the carrying out of these details, or should the disease fail to respond to the treatment outlined above, the vegetations may be snipped off and the base cauterized.

Chancre.—It is very necessary that the primary venereal sore should be recognized, not only for the purpose of intelligent treatment, but also in view of the possible ulterior consequences. The chancre comes singly, is sharply defined, is not sunken or elevated above the level of its environments, is dusky red or copper colored, and has an infiltration at the base which is hard and disk-like. When taken between the fingers the base gives the impression of sheet-lead. This latter is especially characteristic of chancre. The sore is not tender, and seldom itches. The inguinal glands enlarge on both sides, but are not sensitive, and have no tendency to suppurate. A chancre may ulcerate at the center, but the periphery retains its distinctive characters.

The Chancroid.—The chancroid, unlike the chancre, is multiple. It also is sharply defined; but the infiltration is deeper and more nodular. The base is fissured and covered with a yellowish or greenish-yellow scum. It suppurates freely. It is more apt to be painful, is often excavated, and sometimes phagedenic. The inguinal glands are speedily involved, but, unlike chancre, one side only may be affected. They become greatly enlarged, and are tender and painful and prone to suppuration.

Treatment.—The chancre is self-limited and not amenable to treatment. One of the best local applications is a powder consisting of 3 parts of oxid of zinc to 1 of calomel.

Chancroids should be cauterized with nitric or carbolic acid, and dressed with antiseptic. A convenient application is that of carbolized oil. The sore is auto-infectious, and scrupulous cleanliness should be maintained to prevent new foci of infection.

Syphilitic Hypertrophy of the Vulva.—This, which in some respects resembles elephantiasis, is frequently met with in this latitude. It usually affects both labia. It occasionally ulcerates and may be

covered with warty growths. It is rebellious to treatment. An antisyphilitic course should first be tried and if ineffectual be followed by excision. The syphilitic skin eruptions, the gummata, and mucous patches are similar to those found elsewhere.

NON-SPECIFIC DISEASES.

Injuries of the Vulva.—These usually result from blows, kicks, or falls, and result in contusions, lacerations, or punctured wounds. Criminal assault and the first marital embraces are occasionally the cause of serious damage to the structure. Contusions should be treated on general principles, lacerations sutured, and hemorrhage controlled by compression or deep sutures. Care should be taken to prevent infection by strict observance of cleanliness.

Varicose Tumors of the Vulva.—These consist of overdistended veins, and are the result of interference with the venous circulation. The trouble is usually located in the pelvis. Pregnancy is the most common cause, but the condition may arise from any kind of a pelvic growth that interferes with the circulation. They are found most frequently on the labia majora. They vary in size from a barely appreciable enlargement to that of the fetal head. They may rupture, giving rise to profuse hemorrhage. This accident is most likely to occur in pregnancy or in the act of parturition. If troublesome or thin-walled, they should be supported by a compress and bandage. In case of rupture the hemorrhage may be controlled by firm compression, ligation, or deep suturing. They usually disappear or cease to be troublesome after the cause has been removed.

Hematoma of the Vulva.—Hematoma, or blood-tumor of the vulva, is due to the rupture of a blood-vessel. It occurs most frequently in parturition. It is sometimes the result of violence: blows, kicks, falls, etc. It manifests as a swelling of variable size. It is of a purplish aspect, and tense or doughy according as it is observed immediately or some time after the accident. If small it will usually disappear through absorption, provided it does not become infected. If large, or if infection occur, it should be laid open, cleansed, and packed with gauze. In all cases the patient should keep her bed and a light compress be applied. It is needless to say that infection should be guarded against by scrupulous cleanliness.

Elephantiasis of the Vulva.—This is a disease of the tropics, and is rare in this latitude. It consists of an enlargement of the vulva due to an hypertrophy of the skin. The skin becomes greatly thickened and overgrown in all its dimensions. The growth occasionally

attains enormous proportions. It may be hard or soft, smooth, corrugated, or warty. It occasionally ulcerates in places as the result of uncleanliness and attrition. The clitoris is sometimes involved. It is due to an occlusion of the lymph-channels, with consequent accumulation of lymph in the lymph-spaces and hypernutrition. It is to be differentiated from lupus and carcinoma. In these latter the induration is deeper, the ulceration more extensive, and the growth more rapid. In lupus there is more discoloration. In case of doubt the microscope should be called into requisition.

The scientific expedition recently sent to Nigeria by the Liverpool School of Tropical Medicine report that they have discovered in mosquitoes the bacillus which causes elephantiasis. They believe that the experiments which are now being carried on to stamp out malaria by preventing inoculation by mosquitoes can be successfully applied to elephantiasis.

NEOPLASTIC GROWTHS.

The neoplastic growths of the vulva embrace a very large variety. The most common of the benign growths are lipoma, myxoma, fibroma, and enchondroma. These possess the same characteristics and demand the same treatment as similar growths elsewhere. The greatest interest attaches to the malignant growths, both on account of their frequency and destructiveness. As much will be said on the subject in succeeding pages, I have thought it better to anticipate the consideration of malignancy as affecting special organs by some general considerations which will apply to all.

Malignant Growths.—A malignant growth is inherently destructive to life. It is furthermore infectious within the body in which it is developed, and will continue to develop so long as a vestige of the growth remains and has living tissues to feed on. Other growths may kill by pressure or interference with the functions of important organs, but they have not the power of regeneration from a small residue left after operation, nor are they infectious. It is a curious fact that, while malignant growths are capable of infecting the body in which they develop, they are not transmissible to other bodies. If such were the case few surgeons would escape, as the surgeon is constantly delving in malignant tissues and oftentimes exposing himself by slight wounds incident to the operation.

Malignant growths are always in their beginning distinctly localized, and if thoroughly eradicated are no more prone to recur than other growths. The manner of extension is by peripheral growth and

metastasis. Metastases occur by way of the blood- and lymph- currents, through which particles of the growths, or the active principle of the same, are wafted to parts more or less remote, and finding lodgment proceed to develop. In this way secondary foci may be established in organs and structures very remote from the site of the primary growth. The seeds of infection are sometimes scattered in the process of operation, causing the development of the growth in the line of the wound. The malignant growths of the female genitalia are carcinoma, epithelioma, and sarcoma. Of these, sarcoma is the least frequent. Carcinoma and epithelioma are developed from epithelial cells, sarcoma from connective tissue. The epithelial growths—carcinoma and epithelioma—are distributed by way of the lymphatics, while the sarcomata follow the blood-current.

Causes.—The causes of malignant growths are not understood. There is some reason for suspecting that carcinoma is of parasitic origin. If so, the parasite does not seem capable of successful transplantation from one person to another. This, however, does not disprove its parasitic character, for some of the larger, well-known parasites cannot thus be transplanted, such as the ordinary tape-worm. There is a wide-spread belief that heredity plays an important rôle in the production of these growths. Such, however, is not the case, as only about 14 to 18 per cent. of cancerous cases give a history of heredity. In uterine cancer the ratio is even less. Trauma has also been held accountable for many cases, but investigation shows that only from 3 to 8 per cent. of the cases of malignant disease furnish a history of a pre-existing injury to the part in which the growths develop.

General Characters of Malignant Growths.—Even the most minute and painstaking description of a malignant growth will often fail to convey the idea by which it may be diagnosticated. Nevertheless, there are certain general characters of malignant growth that are suggestive, and may greatly assist in establishing a diagnosis. The mere fact that a growth is suspected of being malignant will often lead to an investigation through which a definite diagnosis may be achieved. As it will be quite impracticable in this connection to give an extended description of all the varied forms of malignancy that may affect the different parts of the genital tract, the few suggestions here given may be of value by giving a cue to the investigation. Malignant growths are of different consistence, and are usually denominated hard or soft. The denser growths, when imbedded in the tissues, are hard, nodular, and intimately blended with the tissues in

which they are imbedded, consequently immovable. The softer growths are also immovable. The malignant growth in its latter stages, when it ulcerates or begins to break down, is very friable, so as to be easily chipped off by the finger-nail, and is unctuous when rubbed between the fingers. As a rule, it bleeds easily and on slight provocation, and emits a disagreeable odor. The bottom of the ulcer is usually uneven and foul, the sides irregular and craggy, and the margins elevated, lumpy, and indurated.

MALIGNANT GROWTHS OF THE VULVA.

Malignant growths of the external genitals are comparatively rare. Here the epithelioma, in point of frequency, predominates. It also pursues a course so methodical and distinctive as to merit separate consideration.

Epithelioma of the Vulva.—The starting-point of the vulvar epithelioma is usually on the mucous surface of the lower portion of one of the greater labia. It usually occurs in the form of small, rounded, masses of a whitish or dirty white color, and which project slightly above the surface. These little masses are hard and insensitive. They are of indolent growth, and often remain dormant for a long time. Sooner or later a zone of increased vascularity surrounds the growth, which is the signal for increased activity in its development. It begins to enlarge, casts its epithelium, and ulcerates. The margins of the ulcer are elevated, hard, and livid, while the floor is uneven, granular, and bathed in ichorous pus. In the ulcerative stage, if the infiltrated mass be grasped between the thumb and finger, little maggot-like bodies may be pressed out. These are the contents of the so-called cell-nests, and consist of massed epithelium. They are almost pathognomonic of epithelioma. A more or less exuberant papillomatous growth sometimes springs from the floor of the ulcer. The growth is usually confined to one labium, and seldom invades the vagina or abdominal wall. Later it may pass to the perineum and upper part of the thigh. The inguinal lymphatic glands are slow to become involved, but when such is the case a new impetus is given to the disease, and it spreads with great rapidity, and involves the deeper tissues.

Symptoms.—Violent and persistent pruritus is an almost constant accompaniment of the disease, and is most pronounced in the earlier stages. Pain does not usually manifest itself until ulceration has occurred. It then becomes more or less persistent. The odor from

the ulcerated surface is quite disagreeable, but not comparable to that of carcinoma. Hemorrhages sometimes occur. The appetite is lost, sleeplessness supervenes, and the patient becomes wasted and cachectic. The average duration of the disease, from beginning to end, is from two to three years.

Carcinoma of the Vulva.—This is much less frequent than epithelioma. It occurs, for the most part, in the aged, and assumes a scirrhus form. Its favorite site is in the labia majora, or in or about the clitoris. It usually develops in the deeper tissues and rapidly makes its way to the surface. The skin or mucous membrane becomes pinned down to it before the growth has approached the surface, and produces a depression over the site of the tumor. The ulcer is not unlike that of epithelioma. Speedy involvement of the inguinal lymphatics and wide dissemination of the disease are characteristic.

Symptoms.—The symptoms are similar to those of epithelioma, but more pronounced. The pain is greater, the hemorrhage more profuse, the discharges more abundant, and the odor decidedly offensive. The patient declines rapidly and death comes early.

Sarcoma of the Vulva.—This is the rarest of the malignant diseases of the vulva. Its favorite site is in the nymphæ. Its progress is generally slow.

Treatment.—Early and complete removal of the growth, whatever its character or situation, is the only rational treatment. Excision by the knife is the preferable method, in that the amount of tissue to be removed can be accurately gauged. It is furthermore cleaner, more expeditious, and less painful than by any other method. There can be no question but that good and efficient work may be done here as elsewhere by escharotics or the actual cautery, especially in the hands of those who are accustomed to their use, but the suffering attending their use, oftentimes long drawn out, forms a serious objection to their employment. Whatever method is used, the aim should be to remove every vestige of the disease by going wide of the growth, else the inevitable result will be a speedy recurrence. The inefficient use of caustics, by irritating the tissues and producing hyperemia, stimulates the growth to increased activity, and thereby hastens, rather than retards, the progress of the disease. When the disease has passed the confines where it can be followed by knife or cautery, or has involved the lymphatics, the treatment should be palliative. Detergent washes and lotions to keep it clean, such as the non-toxic antiseptics, styptics and compresses for the bleeding, and anodynes for the pain are indicated. A saturated solution of chlorate of potash, applied in

the form of wet compresses, is an excellent deodorant, antiseptic, and anodyne. Hydrogen dioxid is antiseptic and a powerful hemostatic.

VULVO-VAGINAL HYPERESTHESIA AND VAGINISMUS.

As these two affections originate from the same causes, are amenable to the same treatment, and are practically the same in their essential features, they are here considered as a unit.

In vulvo-vaginal hyperesthesia there is extreme sensitiveness of the introitus vaginæ and contiguous parts. In vaginismus there is superadded painful contractions of the constrictor cuni muscles when the parts are touched. The condition exists in various degrees of severity, and in its severer forms interposes an effectual barrier to sexual relations. It is an affection of the nerves, and usually depends on some local lesion or irritant. It may be reflex or even of constitutional origin. Inflammation or cicatricial contractions at the site of the hymen, with or without erosions, are the most constant local indications. Sometimes there is a slight hyperemia or puffiness of the parts, at other times absolutely no local indications whatever. It is sometimes associated and seemingly dependent on an inflammation of the internal organs of generation. Reflex irritation from an anal fistula has been known to cause it.

Treatment.—The cause should be sought for and treated *secundem artem*. As a routine measure, dilatation of the vaginal entrance yields excellent results. The manipulations should be gentle and the demeanor of the physician such as to reassure the patient. Harsh measures will defeat the aim of the physician by awakening an unconquerable fear and antagonism of the patient and depriving him of her co-operation. Therefore, unless it be decided to give an anesthetic, which will not usually be resorted to until other measures have been tried and failed, gentle and graduated dilatation will be the method of choice. As a preliminary, a prolonged warm sitz-bath, followed by a local application of some soothing lotion or ointment or vaginal suppository, will be of material benefit. For this purpose, cocaine, belladonna, or menthol may be used. An ointment consisting of equal parts of the ointments of belladonna, stramonium, and oxid of zinc, applied at intervals of from four to eight hours, is most efficient. Erosions should be touched with pure carbolic acid or lunar caustic, preferably after the use of cocaine. The finger, well lubricated, may now be introduced into the vagina with all possible gentleness, and permitted to rest there a few moments. Then, by gradually increasing

pressure in various directions, a moderate degree of tolerance is established. This may be followed by the introduction of a bivalve speculum, or, better still, by one of the smaller sizes of the graduated rectal dilators. The instruments should be well warmed and lubricated, and dilatation accomplished by slow and easy stages, either by opening the blades of the speculum or by the introduction of the consecutive sizes of the dilator. Time and patience are requisite for the best results. In the intervals of treatment one of the graduated rectal dilators—the largest compatible with comfort—should be worn for several hours each day. This may be introduced by the patient at her home. If this treatment, after fair trial, prove unavailing, the patient should be anesthetized, the remains of the hymen removed with curved scissors, and, if the introitus vaginæ be found below the normal in size, deep incisions should be made on either side the median line, and a large-sized Sims glass plug introduced. This plug should be worn for several days unless there be some special

Fig. 44.—Sims's Glass Plug.

contra-indications, and several hours each day thereafter for a period of two weeks. Attempts at sexual intercourse should be interdicted during the treatment and not resumed until a normal degree of tolerance has been established. It will often be found necessary to combine constitutional with the local treatment. The bowels should be kept soluble.

COCCYGODYNIA.

Coccygodynia is an affection of the coccyx characterized by pain on pressure or motion. The pressure may come from without, as in sitting upon a hard surface, or from within, as in the act of defecation. Sexual intercourse is sometimes intolerable. Contraction of the attached muscles elicits pain by communicating motion to the bone. This occurs in various inflexions and postures of the body, especially in the acts of rising from the sitting posture and in sitting down. The condition may be recognized by seizing the bone between the thumb and finger—the finger being in the rectum—and rocking it

back and forth, which will elicit the characteristic pain. The condition most frequently depends upon a localized arthritis, and usually follows injury from a fall, a kick, or a blow. In many instances the bone has been fractured, occasionally necrosed. A fracture of the bone resulting from parturition in advanced life after the bone has become rigid from ankylosis is an occasional cause. Rheumatism is responsible for a proportion of the cases. The condition is sometimes intermittent, especially in cases of rheumatic origin. It sometimes disappears spontaneously. In the severer forms dependent on necrosis it will persist for years or until relieved by surgical interference.

Treatment.—Immobility and rest of the diseased bone are the prime requisites. Pressure should be averted by the use of an air-cushioned seat (the inflatable rubber ring) and by keeping the bowels soluble. Sexual intercourse should be interdicted. Movements that

Fig. 45.—Inflatable Rubber Cushion.

bring into play the muscles of the coccyx should be guarded against as much as possible. Blisters, counter-irritants, and anodyne applications may be used over the site of the bone. A liniment composed of equal parts of wintergreen-oil and soap liniment is of value, as is also the local application of the tincture of aconite.

Operations.—In inveterate cases it sometimes becomes necessary to remove the coccyx. This is accomplished by making a longitudinal incision over the coccyx, severing the muscular attachments at the sides and tip, lifting it up on the finger, and disarticulating from the inner side at the second joint. The opening may be closed immediately by deep sutures or packed lightly with gauze and allowed to heal by granulation. This operation becomes imperative in cases associated with necrosis.

Subcutaneous tenotomy will give immediate relief in most cases, which by securing rest to the parts results in a permanent cure in a

limited number. As, however, the severed structures soon become reunited, its benefits are usually of short duration. The tenotome is entered at the tip of the coccyx and swept around the bone so as to sever all muscular attachments at the tip and sides.

CLASSIFICATION OF THE INFLAMMATORY AFFECTIONS OF THE GENITAL ORGANS.

Believing the classification of the inflammatory affections of the genital organs according to any fixed standard is a hindrance, rather than a help, to the understanding, I have adopted none. Classification is all right when it simplifies and elucidates, it is all wrong when it complicates and confuses. It is wrong when it foists certain features of a disease into prominence at the expense of others of equal importance. As yet there has been no classification sufficiently simple and comprehensive as to merit acceptation. Some authors classify upon an etiologic basis, others upon a histologic basis, and others still upon the clinical features. This has given rise to such a multiplicity and mixture of so-called varieties as to defy systematization and destroy all cohesiveness. The terms used to designate the various types and varieties are in general use, and cannot be ignored. Neither can they be reconciled and affiliated in any system of classification. To adopt one to the exclusion of the others would be at the expense of perspicuity; to adopt all would involve so much prolixity as to be cumbersome and confusing. The simplest and most intelligible method will be to ignore classification altogether, and to describe in order the various phases and modifications of the inflammatory process without reference to any fixed standard. To illustrate: I have a case of endometritis, of septic origin, acute in character and affecting chiefly the glandular structures. If I were to tell you that I had a case of septic endometritis you would form no adequate conception of the real state of affairs. If I were to speak of it as an acute endometritis or a glandular endometritis, you would still be in the dark. But if I were to speak of it as a case of acute, septic, glandular endometritis, the condition would be expressed in a few words and convey an intelligible idea of the real condition.

CHAPTER XI.

DISEASES OF THE VAGINA.

ATRESIA AND STENOSIS OF THE VAGINA.

ATRESIA of the vagina indicates a complete occlusion of the canal; stenosis denotes a contraction or stricture of the same. Imperforate hymen, as the obturator of the vaginal orifice, is in its causes and effects identical with atresia of the canal itself, and will

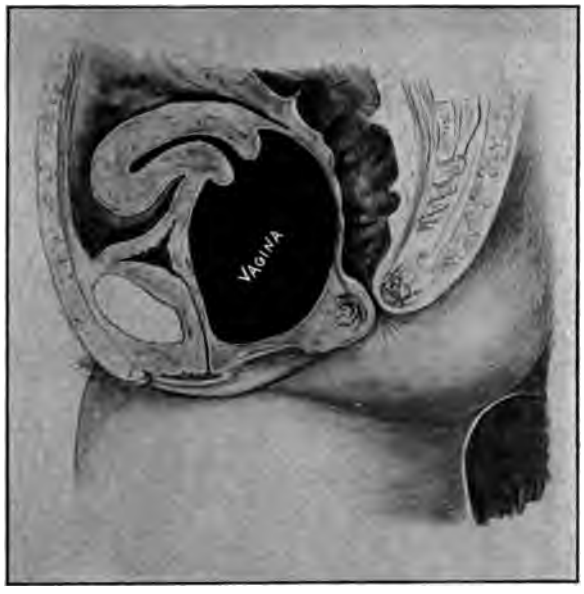


Fig. 46.—Hematocolpos.

be considered in this connection. The atresia may affect any portion of the canal or all of it. It may be congenital or acquired. In either event it is usually the result of inflammation followed by epithelial desquamation or sloughing, with consequent adhesions of the opposing surfaces. The acquired form may result from trauma, from mechanical and chemical irritation, from sepsis, and from systemic affections, such as typhoid fever, diphtheria, and the exanthemata. One of the most common causes is inflammation and sloughing following child-

birth. Total or extensive obliteration of the canal, as a congenital condition, is generally associated with a developmental defect of the uterus and adnexa, and there are no sequences in the way of imprisoned fluids. The closure of the vaginal canal is not usually attended with any ill effects until after the establishment of menstruation. With the accumulation of the menstrual fluid the vaginal canal becomes distended (hematocolpos, Fig. 46), which, if not relieved, progressively affects the cervical canal, uterine cavity (hematocolpometros, Fig. 47), and Fallopian tubes. The uterine and vaginal walls become hypertrophied and thickened.

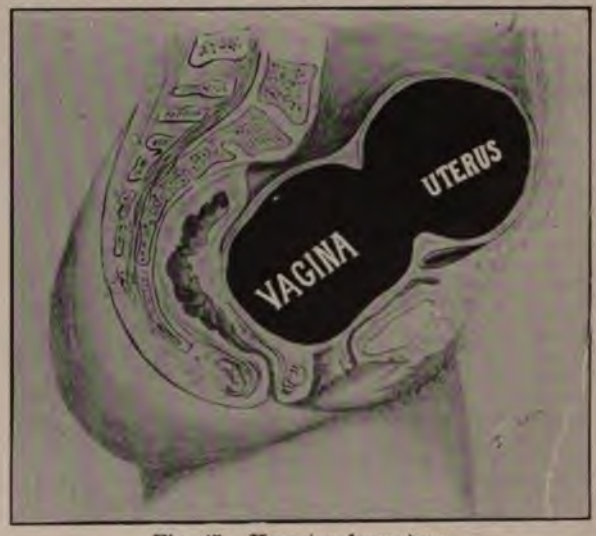


Fig. 47.—Hematocolpometros.

When the tubes are involved a localized peritonitis frequently ensues, which results in adhesions, the tubes being bound down to the structures with which they are in relation. This, as will be seen presently, adds an element of danger to the condition which must be remembered when operating for atresia. Occasionally the tubes rupture from overdistension or as the result of accident, giving rise to pelvic hematocele. Dilatation of the tubes and uterus from the accumulated menstrual fluid is much more apt to occur where the atresia is situated in the upper part of the vagina. With the enlargement of the organs concerned, pressure symptoms are developed, especially affecting the rectum and bladder. Constipation, painful defecation, and hemorrhoids are common. The bladder may become irritable, and

there may be incontinence, retention, or dysuria. There is, of course, no external evidence of menstruation, and this oftentimes is the cause of solicitude which impels the patient to seek medical advice. Occasionally the menstrual effort is signaled by pains,—distension pains and pressure pains,—resulting from the additional fluid poured into the cavity. These pains, corresponding in time to the normal menstruation, sometimes afford a clue to the real difficulty. On rare occasions the anomaly is presented of a double uterus and vagina, one of the canals of which is pervious and the other occluded. The occluded canal becomes distended with fluid and bulges toward and encroaches upon the normal canal. In the absence of determinate evidence of the double uterus, the slowly increasing, softish tumor felt within the normal canal is apt to be misinterpreted. More especially is this the case when the woman menstruates regularly from the normal canal, which is the only obvious vagina. Occasionally the septum ruptures and the contents of the occluded canal discharge into the other. Pyogenic germs may thus gain entrance, and purulent inflammation of the affected side ensue.

Vaginal stenosis is even more frequent than atresia. A tight stricture of the vagina may produce many of the symptoms of an atresia. Oozing of the pent-up secretions, however, usually betrays the real nature of the trouble, and may lead to the detection of the small orifice through which they make their escape. Infection and suppuration of the tract above the stricture are very liable to occur.

Diagnosis.—The imperforate hymen is readily recognized by separating the labia, when it will be found blocking the vaginal entrance. If the canal above it be distended with menstrual fluid, the membrane is bulged outward and is soft and elastic to the touch. Atresia of other parts of the canal may be made out by examination through the rectum, aided, if need be, by a sound in the bladder. Should the atresia be located in the upper part of the vagina, a finger in the vagina and one in the rectum will outline the upper and lower boundaries of the occlusion. To outline the accumulation, and to determine to what extent, if any, the uterus and tubes are involved, the bimanual examination with one finger in the rectum will be necessary. The pent-up fluids, while usually consisting of menstrual fluid, sometimes represent the normal secretions of the uterus and upper part of the vagina. If infection has taken place it may be purulent in character. Where it is desirable to determine this point, a little of the fluid may be withdrawn by aspiration for inspection, care being taken not to carry infection into the cavity.

Treatment.—Surgery offers the only chance of relief. The object will be to make an avenue of escape for the pent-up fluids along the natural route. The dangers attending the operation are threefold: sepsis, injury to the rectum or bladder, or bursting of the Fallopian tubes. To avoid the first, every step of the operation should be conducted with strict reference to aseptic detail. Where the obstruction is low down in the vagina, or where it forms only a thin diaphragm with a distended canal above, there is little danger of wounding the rectum or bladder; but, where a considerable portion of the canal is impervious, it will be necessary to use all diligence to prevent this accident.

With a finger in the rectum and a sound in the bladder, a transverse incision is first made as a starter. Then, advancing in a line with the normal course of the canal, the dissection is carried upward to near the upper extremity of the obstruction. This dissection, after the initial cut, should be effected largely by the finger, occasionally

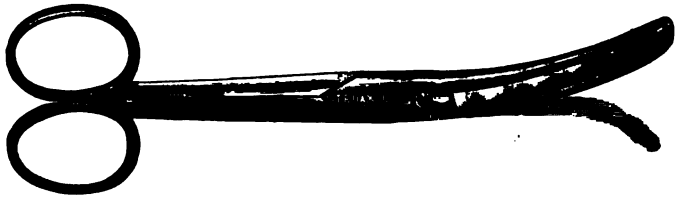


Fig. 48.—Blunt Curved Scissors for Atresia Vaginæ.

bringing into requisition the knife or scissors to sever unyielding bands, but never in advance of the finger. Frequent reference should be made to the guides in the rectum and bladder, and great care should be taken to keep equidistant between them. Usually the dissection is easy, the loose connective tissue leading unerringly to the open canal above; but occasionally it is the very reverse, and will require great care and tact to avoid serious injury to the contiguous viscera. In one instance I found myself cutting into the peritoneal cavity unexpectedly.

When the dissection has been carried to within a fraction of an inch of the upper extremity of the solidified portion, as indicated by the finger in the rectum, and also, as a rule, by the sense of elasticity, and there is reason to believe that the tubes are implicated, dissection is stopped and provision is made against the third danger. The object is to prevent the too sudden emptying of the uterus and vagina, with the consequent contraction, which, by dragging on the

tubes, might rupture them. Hence, at this stage of the procedure the usually distended cavity is tapped with a trocar, and the fluid—which is usually thick and tarry—drawn off very gradually. After it has been exhausted the trocar is withdrawn, the opening enlarged, and the chambers gently, but thoroughly, douched with some antiseptic fluid. It is now loosely packed with gauze, which may be replaced with fresh gauze in twenty-four hours, after douching. In case of imperforate hymen, or in any other condition in which the tubes are not involved, a free opening may be made at once with the aseptic precautions and after-treatment outlined above.

In many instances the case is one of stenosis instead of atresia. The opening is sometimes so minute as to escape observation. In the hymen it usually exists immediately beneath the urethra. When the opening can be found, a small probe introduced through it will furnish a guide for the knife. In cases of extensive and complete atresia of the canal, accompanied by absence or want of development of the internal organs of generation, operation is not indicated. An artificial vagina, made under these circumstances, closes up very promptly by adhesive inflammation.

In one notable case I was applied to by a young lady, 18 years of age, of good physical development and in perfect health, who had never menstruated. On examination I found complete absence of the vagina and no evidence of uterus or ovaries. I stated to her the hopelessness of permanent result from operative interference; but, as she desired to marry, she insisted on an artificial vagina being formed. I finally consented and made an ample vagina, and enjoined upon her the necessity of wearing a glass plug daily. She married soon after, and many months subsequently I received a letter from her with the cheering assurance that all was well with her up to date. In subsequent operations of like nature I have not been able to keep the canal patulous for any length of time. There must be a discharge from above to insure the perviousness of a canal.

VAGINITIS.

Vaginitis is an inflammation of the vagina. It occurs in two forms: acute and chronic.

Causes.—By far the larger proportion of the inflammatory affections of the vagina are due to microbic infection. In the adult female and including the period of sexual activity, the vagina is protected by a covering of pavement epithelium which is dense and resistant.

This protecting cover is proof against germs under ordinary conditions. The vagina being the natural habitat of a variety of germs, and the female at this period of her life being subjected to a variety of deleterious influences in her sexual relations, if it were not for this provision vaginitis would be much more common than at present. The vagina and those portions of the genital tract above the vagina are still further safeguarded by a germ which inhabits the canal, which is not pathogenic, and which produces an acid secretion which is inimical to other germs. This is known as the acid-secreting germ of Doederlein. None of the pathogenic germs of the genital tract, unless it be the gonococcus of Neisser and the gas-secreting germ of Welch, can thrive in the secretions of this germ, and, although the vagina is exposed to constant invasion of all kinds of germs from the outer world, those inhabiting the canal are, as a rule, passive and innocuous. This, of course, presupposes an intact vagina and the functionally active germ of Doederlein.

The virulence of the pathogenic germ decreases progressively from the introitus vaginæ, where it first meets the germ of Doederlein, to the os externum. In the battle which ensues in its upward passage, the invading germ, if it succeeds in reaching the upper portion of the canal, does so in such an enfeebled state that it is content to lie down, being divested of both procreative and pathogenic energy. It is claimed that the bacillus aërogenes capsulatus, or the gas-secreting germ, and the gonococcus are immune from the influence of the acid-secreting germ. I am skeptical as to the immunity of the gonococcus, for, though it will apparently pass the barrier and make its way into the uterine cavity, it should be remembered that the active gonococcus is seldom found in the vaginal canal, and that its entrance into the cervical canal without running the gauntlet is usually vouchsafed by its being deposited at the very threshold with the ejaculated semen.

Simple vaginitis may arise from mechanical injury, strong chemicals, acrid discharges, extraneous secretions (such as urine or feces), or any kind of irritation not dependent on pathogenic germs.

Gonorrheal, or, as it is sometimes called, *specific vaginitis*, is due to gonorrheal infection, and has for its distinctive emblem the gonococcus of Neisser. Directly and indirectly it is by far the most common cause of vaginitis. It is probable that the greater number of cases of specific vaginitis arise from the irritating cervical discharges incident to gonorrheal endometritis rather than to direct specific infection of the vagina. The gonococcus is a surface germ and has little tendency to invade the deeper structures. It, therefore,

produces a skimming inflammation, and is usually found under the surface epithelium. It is, however, frequently associated with other pathogenic germs, when it becomes more virulent, more penetrating, and more disastrous in its effects.

Septic Vaginitis is due to septic infection. The infection always comes from without, and is usually the result of carelessness. Operations on and manipulations of the vagina with unclean instruments or hands are prolific causes. This form of infection is both more frequent and dangerous in the puerperal state. The streptococci and staphylococci are the germs most frequently concerned in this form of vaginitis.

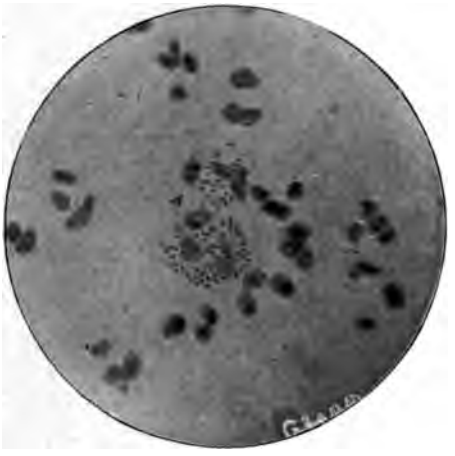


Fig. 49.—Gonococcus of Neisser. (Photomicrograph by Gramm.)

The *clinical features* of one form of vaginitis do not differ materially from those of another. In general, it may be said that bacterial vaginitis is more virulent, more persistent, and farther reaching in its effects; the germs multiply and invade other organs, whereas the simple inflammation confines itself to the area of irritation. The germs may, and frequently do, traverse the vagina, mount to the uterus, and invade the Fallopian tubes, thereby leading to the most dire consequences. They invade the vulvo-vaginal ducts and the urethra. A urethritis complicating vaginitis is strongly suggestive of gonorrheal or septic infection. A simple vaginitis sometimes becomes converted into a specific or septic one by the subsequent implantation of germs. Septic vaginitis sometimes manifests in the form of a dirty-grayish deposit on the vaginal wall. This is usually spoken of as diphtheritic vaginitis, but is probably due to

some other than the diphtheritic germ, as the bacillus of Löffler is seldom found in the detached membrane. The membrane, being an infiltration, instead of a surface exudation, is firmly attached to the subjacent structures. Owing to the protective covering of the vagina, gonorrheal vaginitis cannot occur without injury to the epithelium. Maceration of the epithelium from superabundant or abnormal discharges is an occasional precursor. The same rule holds good in large measure as regards septic infection. In the extremes of life—in childhood and old age—the epithelial covering of the vagina is much thinner, softer, less resistant, and consequently much more vul-

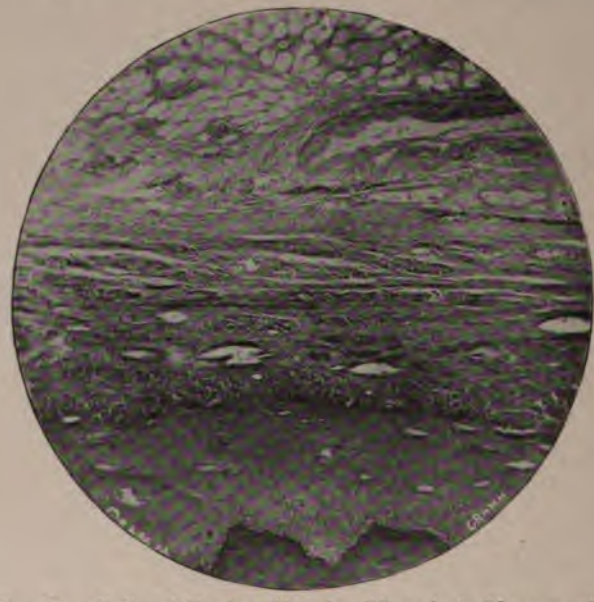


Fig. 50.—Walls of Vagina, Showing Muscularis Mucosæ, etc. (Photomicrograph by Gramm.)

nerable. Hence, germ infection is much more likely to occur on exposure, though the opportunities for infection are much less frequent than during the period of sexual activity.

Aside from the local causes of vaginitis just named, there are certain disordered conditions of the general system that occasionally lead to vaginitis. Especially does this apply to the exanthemata and other conditions of the system that tend to produce inflammatory states of the mucous and cutaneous surfaces. The pelvic congestions incident to pregnancy, abdominal tumors, and constipation are predisposing factors.

Symptoms and Course.—In the acute form the disease is characterized by a sense of fullness, burning, and itching of the vagina, especially marked at the vaginal orifice, and in the gonorrheal form it is apt to be accompanied by frequent and painful urination. Occasionally there is more or less systemic disturbance in the way of accelerated pulse, increased temperature, irritability of the stomach, and disorders of the nervous system. In the chronic form there may be an almost total absence of subjective symptoms. In the initial stage the parts are dry, red, and swollen. This is soon followed by a serous discharge, which in turn becomes purulent. It is sometimes muco-purulent from the admixture of secretions from the cervix or fornix vaginæ. In the more virulent cases the discharge becomes greenish from the admixture of blood. It is seldom that the entire vaginal surface is involved, and, as a rule, especially in the earlier stages, the disease is confined to one or more isolated spots. Patches of exfoliation occur here and there, and the papillæ become enlarged. In pregnancy and other conditions attended by excessive hyperemia of the canal, the papillæ become very conspicuous and granular in appearance. This constitutes the so-called *granular* vaginitis. Occasionally, and especially in children and old people, in whom the epithelium is soft and thin, the opposing surfaces become agglutinated (adhesive vaginitis). In these cases the inflammation is seldom diffuse, but, on the contrary, distinctly macular.

Small accumulations of gas sometimes take place in the connective tissues and lymph-spaces of the upper portion of the vagina, which may be observed as little bladders projecting from the surface. They crepitate on pressure and collapse when punctured. It occurs most frequently in connection with pregnancy. The cause of this condition (emphysematous vaginitis) is the gas-secreting germ, or the bacillus aërogenes capsulatus. Vesicles sometimes form on the inflamed surface, and in the upper part of the vagina small, nodular bodies are sometimes observed which resemble and are supposed to be inflamed follicles.

Treatment.—For the acute form in the active stage the object will be to remove all sources of irritation, maintain cleanliness, relieve local congestion, and secure rest. The patient should be put to bed, the bowels cleared and kept soluble by salines, and the vagina cleansed by douches of hot water, plain or medicated. The douches may be given from a fountain-syringe or irrigator, and the patient should be recumbent with the hips somewhat elevated. The patient may, if necessary, administer the douche herself by lying crosswise the bed

with the hips slightly projecting, her feet supported by chairs, and a rubber cloth so arranged as to carry the recurrent fluid into a receptacle. A more convenient method for self-irrigation is to place

Fig. 51.—Fountain-syringe.

a board or frame-work over the top of a bath-tub, upon which the patient can recline while receiving the douche, or, still better, she may use a douche-pan. At least a gallon of fluid should be used on each

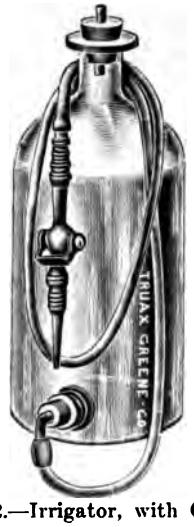


Fig. 52.—Irrigator, with Cut-off.

occasion. These may be repeated at intervals of from two to six hours, according to the activity of the inflammatory process and the amount and character of the discharge. A solution of common salt,

5 to 1000, is efficacious at any stage of the trouble, and may be substituted for the plain water.

A little later mild astringents may be called for: acetate of lead, 5 to 1000; tannin or alum, 20 to 1000. The strength of the astringent may be gradually increased as the acute stage subsides, especially if it assumes a tendency to chronicity. In the specific or septic forms, or in the presence of germ-laden secretions, it is advisable to use antiseptic irrigation, either alone or combined with astringents. Those

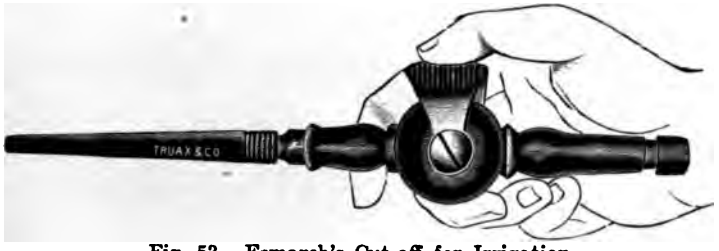


Fig. 53.—Esmarch's Cut-off for Irrigation.

in most common use are: bichlorid of mercury, 1 to 2000; permanganate of potassium, 5 to 1000; carbolic acid, 20 to 1000; and boric acid, 30 to 1000.

With the abatement of the acute inflammatory symptoms, the speculum may be brought into use and applications made directly to the inflamed surface. The vagina may be swabbed with a 1 to 2000 bichlorid of mercury solution, or a 5-per-cent. solution of carbolic acid. Abraded and ulcerated surfaces may be touched with a 5-per-

Fig. 54.—Douche-pan.

cent. solution of nitrate of silver. In gonorrheal vaginitis the vagina may be swabbed with a 10-per-cent. solution of protargol, or it may be used as a douche of a strength of from 1 to 3 per cent. After douching and swabbing, the vagina may be loosely packed with gauze or wool. This packing should be changed at intervals of from a few hours to once a day, according to the amount and character of the discharge. A thorough cleansing of the vagina should precede every packing.

Medicines are sometimes applied in powder form by means of a powder-blower, sometimes in the form of an ointment, sometimes inclosed in capsules, and sometimes as suppositories. In whatever form used it is essential to thoroughly cleanse and dry the vagina before each application. The efficiency of treatment will depend not so much on the multiplicity of remedies as on the proper choice and intelligent use of a few.

Sexual relations should be suspended until after complete recovery, and all traces of the disease should be eradicated before treatment is concluded. Foci of infection should be sought out not only in the vagina, but also in the uterus, urethra, and vulvo-vaginal passages. For quieting the patient and securing rest in the active stage of the disease, phenacetin, codeine, or morphine may be used. It has been fashionable to use suppositories for this purpose, but if used at all they should be used with the utmost care, lest infective matter be carried into the rectum.

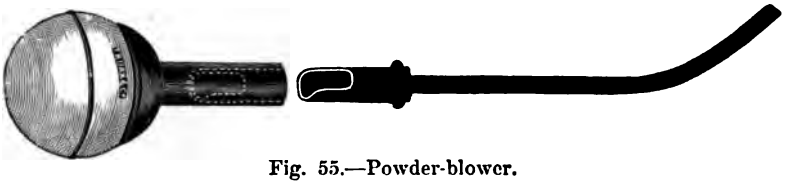


Fig. 55.—Powder-blower.

TUMORS OF THE VAGINA.

Cysts of the Vagina.—Vaginal cysts are much more common than usually supposed, because so often unrecognized. They occur singly or in groups, and may be situated on any portion of the vaginal wall. They are quite superficial, thin walled, and filled with a clear, serous fluid. Occasionally the contents are murky. They may be mucilaginous or purulent in character. The cysts are seldom large, but sometimes attain the size of an egg or even larger. They are usually firmly imbedded and intimately adherent to the surrounding structures, but are occasionally polypoid. They are lined with cylindrical or pavement epithelium. They give rise to no symptoms except, perhaps, an increased leucorrheal discharge, and when large more or less obstruction to the canal. The purulent cyst is usually painful. Vaginal cysts may arise from: 1. Occlusion of the vaginal follicles (retention cysts). 2. From patches of epithelium which have been turned under in operations on the vagina or as the result of trauma (inclusion cysts). 3. From unobliterated spaces in Gaertner's duct.

Treatment.—They should be dissected out and the raw surfaces brought together by suture. When this is not practicable, a large portion of the cyst-wall may be excised, the lining membrane removed or destroyed by chemicals, and the cavity packed with gauze. The gauze should be removed and replaced from time to time until the cavity has healed. Polypoid growths may be ligated and snipped off.

Fibroid Growths in the Vagina.—Fibroid and fibromyomatous tumors of the vagina are sometimes met with. They seldom attain much size, are usually soft and succulent, and in many respects re-

Fig. 56.—Carcinoma Introitus Vaginæ. (Photomicrograph by Gramm.)

semble the vaginal cyst. They should be removed and the wall sutured. Papillary growths should be snipped off and cauterized, and the vagina lightly packed until the surfaces are healed. The fibroid and papillary growths are about the only benign growths that are found in the vagina.

Malignant Growths of the Vagina.—As primary growths these are extremely rare. They partake of the same characters and present a symptomatology very similar to the malignant growths of the vulva. The sarcoma, as a primary growth, is more frequently met with in this

locality than the cancers. The posterior vaginal wall and the posterior vaginal fornix are the favorite sites for all forms.

The diagnosis and treatment are the same as for similar growths elsewhere, but the opportunities for radical measures for the complete eradication of the disease are greatly abridged, as compared with the vulva, and are seldom successful.

CHAPTER XII.

INJURIES TO THE PELVIC FLOOR—MEDIAN LACERATIONS.

It is only within a comparatively recent period that the perineum, its nature and functions have been properly understood. As a consequence, errors in diagnosis and treatment have been painfully prevalent. The old idea of a perineal body as a thick triangular plug, with its base extending from anus to vaginal outlet on the skin surface, and tapering to a pointed extremity in the recto-vaginal septum, has been exploded. In its stead we find only the meeting-point of some muscle-fibers inclosed within several layers of rather dense fascia. It was formerly taught that the muscle-fibers converging from the sides of the pelvis were inserted into the so-called perineal body, and that the natural and inevitable result of a rupture of this body would be the drawing apart and separation of the two halves, with consequent destruction of the pelvic floor and prolapse of the pelvic contents. This view is intrinsically wrong. The pelvic floor is made up, in the main, of the fibers of the levator ani muscles, reinforced by the different layers of the fascia. The fibers of this powerful muscle pass backward from the pubo-ischiatic rami to the sides and posterior aspect of the rectum, distributing in course fibers to the perineum. Roughly speaking, it may be regarded as a sling, which, skirting the vagina, passes backward to infold the rectum. The effect of its contraction would be to lift the rectum upward and forward, which in turn closes the vaginal outlet by pressure from below upward. By reason of this pressure from below the posterior vaginal wall is closely applied to the anterior wall, which it supports.

In the normal vagina in a state of rest we find no open canal, but a transverse slit bounded at either extremity by a vertical slit, which in outline, by cross-section, resembles the letter H. These vertical slits are caused by the apposition of the anterior and posterior vaginal walls, with their necessary infolding over the inflexible tissues at the sides of the canal. They constitute what are known as the vaginal sulci. They are often the seat of lacerations in childbirth, and constitute the most serious lesions of the pelvic floor. One of the greatest evils resulting from lacerations of the pelvic floor is prolapse of the pelvic contents: the anterior and posterior vaginal walls, including the bladder and rectum, and of the uterus.

It has been seen that the effect of active contraction of the levator ani muscles is to close the vaginal orifice by pressure from below. The normal tonicity of the muscle subserves the same purpose, and is the most potent factor in maintaining snug apposition of the vaginal walls and of giving support to the structures above. Consequently a median tear of the perineum, which in no way interferes with the bulk of fibers of this powerful muscle, will not destroy the pelvic floor and will not remove the vaginal support, for the sling passing behind the rectum is still intact and will now, as before, render efficient support to the pelvic contents. (Fig. 57.) True, in complete laceration of the perineum the sphincteric action of the vagina

Fig. 57.—Median Laceration of the Perineum. Sling-like Action of the Levator Ani Maintained.

will have been impaired. True, the transversus perinei muscles, and some of the fibers of the levator ani which are inserted into the perineal raphé, will tend to draw the two halves of the perineum asunder, but the more powerful belt that passes outside of these fibers more than counterbalances their antagonism and keeps guard over the introitus vaginæ. Far different is the effect of a laceration of the vaginal sulci, or of any other portion of the recto-vaginal septum than in the middle line. Here the fibers of the sling are sundered, and in proportion to the extent of the tear is the disability of the pelvic floor to sustain the superincumbent weight of the pelvic contents. (Fig. 58.)

Etiology.—Lacerations of the pelvic floor are, in the vast majority of instances, due to childbirth. Inordinate pains, precipitate labor, unyielding soft parts, faulty position, and the unskillful use of the obstetric forceps are all factors. Occasionally in obese subjects the muscles will be so interlarded as to render them friable, and laceration will occur under what would otherwise be normal conditions. I have known the perineum to lay open like butter before the advancing head with very moderate uterine contractions. Laceration may occur in the delivery of a uterine fibroid. It sometimes

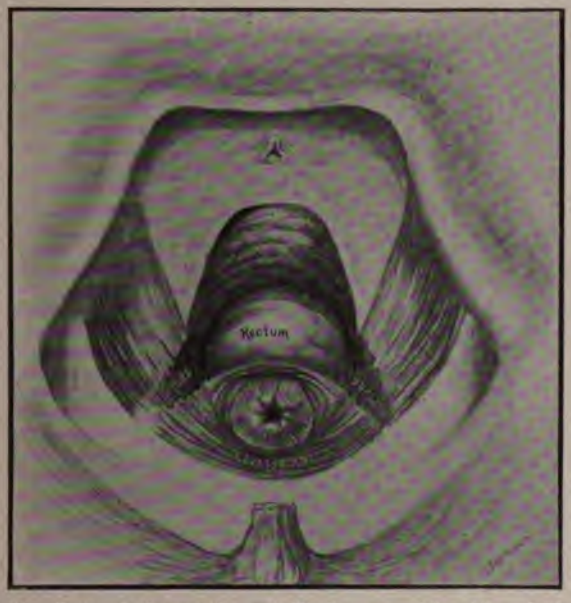


Fig. 58.—Lateral Laceration of Perineum. Sling-like Action of Levator Ani Destroyed.

results from external injury, as in falling on a stake or in sliding down an incline and coming in contact with some hard projecting body. The line of cleavage in lacerations of the pelvic floor may be in the median line or at the sides, one or both.

Median lacerations pass in the median line through the middle of the perineum, and sometimes extend well up into the vagina. These are the most common as well as the most harmless lacerations, as may be inferred from the foregoing. The lateral lacerations are usually confined to the sulci at the sides of the posterior vaginal wall. They are not infrequently associated with a median tear of the peri-

neum. They are the most serious of tears, because of the destruction of the sling-fibers of the levator ani muscles, and the consequent loss of support to the vagina and pelvic organs. Such lacerations, if extensive, are liable to be followed by cystocele, rectocele, and prolapse of the uterus.

Complete and Incomplete Lacerations.—When the laceration involves the sphincter ani, and extends into the rectum, thus converting the two passages into one, it is said to be complete. Lacerations that do not involve the sphincter ani are said to be incomplete. Complete lacerations may extend far up the recto-vaginal septum, or may barely involve the anal outlet. Incomplete lacerations may be shallow or deep, and may even implicate some of the external fibers of the sphincter ani. Not infrequently they skirt around the anus, laying bare the sphincter-muscle without impairing its usefulness. Complete rupture of the perineum, by destroying the action of the sphincter ani, leads to permanent incontinence of feces. This, unless relieved by the art of surgery, renders the subject of it most lamentable. Fecal matter is extruded without let or hindrance, and the intestinal gases are prone to escape with audible sound on the most inopportune occasions. Such unfortunates generally withdraw from society and contact with the outer world, and immure themselves within the four walls of their domiciles. Fortunately, all tears of the sphincter are not so disastrous, and the patient retains a reasonable degree of control under normal conditions; but, with liquid stools and active peristalsis, as in diarrhea, the control ceases.

Diagnosis.—Perineal tears should be looked for and recognized immediately after delivery. Digital examination should not be relied on, as it is inadequate and apt to be misleading. The patient should be placed crosswise the bed on her back with the buttocks well up to the edge. She should be opposite a good light. The legs being supported and the thighs flexed on the abdomen, the physician should separate the labia, wipe away the blood, and examine carefully the extent and direction of the tear. He should not only ascertain the extent of the tear through the perineum, but—what is far more important—should follow it up into the vagina, clearing away the blood and pressing the parts asunder with his fingers. Oftentimes he will be surprised to find the vaginal tear much more extensive than he had anticipated and out of proportion to the external manifestations. The vaginal sulci on both sides should be carefully scrutinized, for it is here that the most damaging lesions occur. The soft and sodden tissues of the vagina immediately after delivery would give little evi-

dence to the most highly educated touch, but to the eye, notwithstanding the general dark suffusion of the mucous membrane and lacerated structures, the rent is easily recognized by its bleeding surface.

In the light of our present knowledge, the timid or careless obstetrician cannot, in such cases, take refuge behind a superficial suturing of the external parts, for the inexorable consequences of a broken pelvic floor will manifest themselves ever after. In old and neglected cases appearances are different. The torn surfaces are contracted, altered in shape and position, and covered with a membrane scarcely distinguishable from normal mucous membrane. According to the depth of the tear the distance between the anus and vaginal opening will be shortened and the vaginal outlet will assume a more horizontal inclination. If the rupture be complete, the vagina and rectum will have a common outlet and the patient will have lost control of the

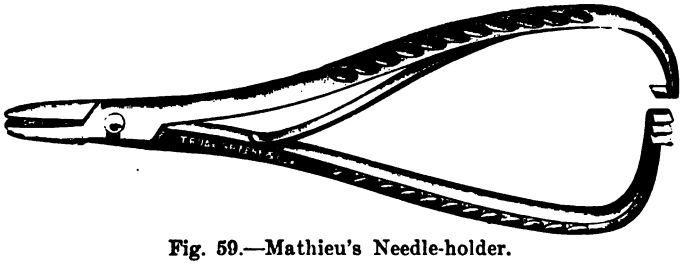


Fig. 59.—Mathieu's Needle-holder.

bowels, in whole or in part. The tendency of the torn sphincter is to retract and straighten out like an unstrung bow. Thus, in time the sphincter is to be recognized as a slightly curved bundle of muscle-fibers on the posterior aspect of the anus. The anterior margin of the anus is formed by the lower edge of the recto-vaginal septum, and runs in a straight line from one sphincter end to the other. It has a sharp, cicatricial edge, and is fringed on its under surface by the protruding mucous membrane of the rectum. This latter is often mistaken for piles.

The degree of retraction of the sphincter is governed by the depth of the tear up the recto-vaginal septum. By retraction of the sphincter the torn edges of the septum become drawn farther and farther apart until they form a straight line across the front of the anal outlet. In shallow tears the ends of the sphincter are sometimes knit together by cicatricial tissue and so closely approximated that the patient experiences little or no inconvenience. For reparative pur-

poses it is essential that the ends of the sphincter should be definitely located, that they may be brought into accurate apposition. In many cases a dimple or depression of the skin marks the site. When such is not the case, teasing the muscle by pulling or pinching it will excite contractions, with consequent indrawing of the skin at both extremities. The skin overlying the sphincter is thrown into radiating folds, which afford a very reliable index of the position and length of the muscle.

Treatment.—The treatment of a torn perineum and of injuries to the pelvic floor is exclusively surgical. Very slight tears involving the perineum alone may sometimes be left to Nature, but even such, if detected early, are all the better for being neatly closed, as they open an avenue for infection of the recently delivered woman. If allowed to heal by granulation they are prone to leave a tender cicatrix. With reference to time, the operations for the repair of the

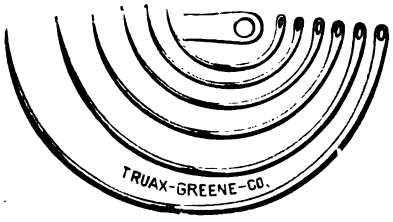


Fig. 60.—Curved Needles.

pelvic floor are classified as immediate, intermediate, and secondary. The operation for the repair of the lacerated pelvic floor, especially the median perineal laceration, is denominated perineorrhaphy.

Immediate Operation.—This is done within the first twenty-four hours after delivery. A physician who attends a case of labor is grossly derelict if he fails to make a careful inspection of the pelvic floor as soon after delivery of the child as consistent with the safety of the mother. If a laceration is found, it should receive immediate attention. There are several and important reasons for this, chief among which are: 1. The parts are in their natural relation, and, if properly brought together and held there by suture, union by first intention occurs and perfect restoration achieved. 2. Neglect of this precaution exposes the patient to infection through the open wound, which if it does not result in anything more serious is liable to entail a protracted invalidism and consequent subinvolution of the uterus and genital tract. 3. It leaves her a cripple so far as the gen-

ital apparatus is concerned, and exposes her to the sequelæ of a damaged pelvic floor, such as prolapse of the uterus and vagina. 4. And, last, as the parts are benumbed from the recent impact of the child's head, the simpler forms of operation can be done without the use of an anesthetic.

Every obstetric satchel should contain the implements for the repair of the pelvic floor. These are a needle-holder, a number of medium sized curved needles, or, as some prefer, a needle with a handle, a pair of scissors, a perineal retractor, and a liberal supply of suture material: silk-worm gut, silk, and catgut. These should be sterilized before the operation and placed on a clean towel within convenient reach. The patient, being brought crosswise the bed and placed on her back, is drawn down until the buttocks are flush with the rail. The legs are flexed on the abdomen and supported by an assistant or some mechanical device. It goes without saying that the operator should have clean hands, and that the patient should be

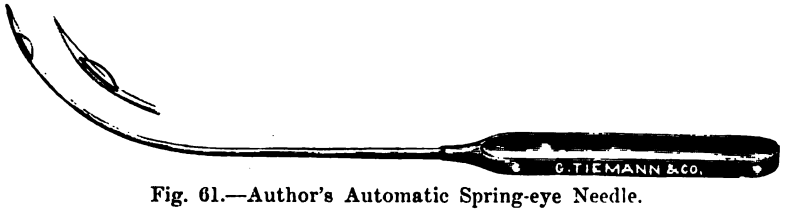


Fig. 61.—Author's Automatic Spring-eye Needle.

The spring is pressed down in passing through the tissues and rebounds when pressure is removed, forming a large eye for facility of threading.

opposite a good light. It is a good plan to tampon the upper part of the vagina, to keep the blood from flowing over and obscuring the field of operation. Clean cloths of any kind may be used for this purpose.

The prevalent practice of introducing all the sutures from the skin surface, while usually efficient in the minor forms of injury if given the proper direction and depth, is clearly inadequate for the more extensive lesions. It should be remembered that there are two surfaces concerned in the rent: the vaginal and skin surfaces. Sutures introduced from the skin surface are liable to leave little pockets on the vaginal aspect, which serve as catch-basins for the secretions, with a resultant sepsis or perineal fistula. It is better, therefore, in most instances to close the vaginal rent neatly, independently of and as a preliminary to the closure of the skin surface. Therefore, after separating the labia with two fingers of the left hand, two or more stitches should be passed deeply on the vaginal side, beginning

near the upper angle of the rent. These stitches should be tied as they are introduced. This will reduce the external wound to a shallow gap, which may be closed by one or more stitches introduced from the skin surface. The sutures should be passed deeply at intervals of from one-half to two-thirds of an inch, and tied with just sufficient firmness to bring the parts into neat apposition. For the less extensive tears in the median line catgut may be used. No after-treatment is necessary. In the more extensive tears involving the vaginal sulci, a retractor should be placed under the anterior wall of the vagina to afford easy access to the parts. Here it may be necessary to use an anesthetic, especially in a nervous patient. Silk-worm gut is preferable as a suture material. The stitches should begin at the upper angle of the rent, and, instead of being passed straight across from side to side, should form a succession of V's down the canal with their apices directed toward the outlet. These when drawn taut and tied will lift the pelvic floor which has sagged from loss of support from the sling-fibers. Each stitch may be tied as introduced, and the sub-

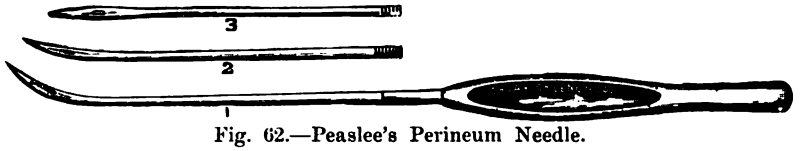


Fig. 62.—Peaslee's Perineum Needle.

sequent steps of the operation are as described in the preceding section. Some operators use but one V-shaped silk-worm gut suture in each sulcus, which is applied at or near the middle of its length, and close the remaining portion of the rent with straight-across sutures of catgut. The vaginal non-absorbable sutures may be left for several weeks. The bowels should be kept soluble and the catheter should not be used if it can be avoided.

Complete Rupture of the Perineum.—In complete rupture of the perineum, a row of interrupted sutures should be passed on the rectal side commencing at the upper angle of the tear and extending to the skin surface. Special care should be taken to secure perfect coaptation of the divided ends of the sphincter-muscle. The sutures should be half deep in the recto-vaginal septum, and should be placed at intervals of about one-fifth of an inch. Catgut is preferable for this locality, as it avoids the necessity of their subsequent removal. One or two reinforcing sutures of silk-worm gut are necessary to secure firm union of the sphincter. These are introduced on the skin

surface just outside the sphincter end, a little back of the torn end, and, describing a half-circle through the septum, emerge on the skin surface of the other side opposite their point of entrance. Interrupted sutures are next placed on the vaginal side, beginning at the upper angle of the rent, and tying each suture as it is placed. (Fig. 63.) Finally, the shallow gap on the skin surface is closed. (Fig. 64.)

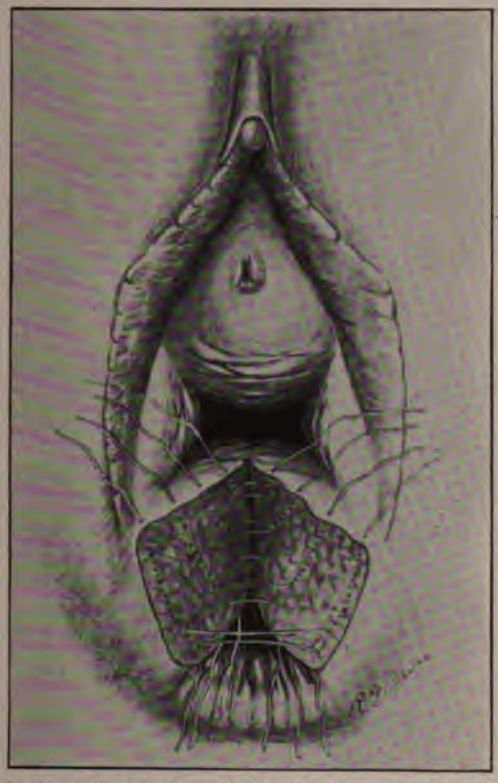


Fig. 63.—Median Laceration of the Perineum, Extending up and Involving the Septum. Rectal and Vaginal Sutures Placed. (First and Second Steps.)

For the vaginal and skin surfaces, silk-worm gut, or this supplemented by catgut, should be used. The bowels should be moved on the third day, and daily or every second day thereafter. The external sutures should be removed on the eighth day, and the others in from two to three weeks.

Intermediate Operation.—This operation, though not often resorted to, gives, in the main, very satisfactory results. It embraces

the period of granulation and cicatrization, and extends from the fifth or sixth day to the second or third week. The torn surfaces are covered with granulations, while a faint bluish-white border at the margins indicates the initial healing process. The surface of the laceration is very considerably diminished in size as compared with its original dimensions. This is due in part to the healing of the

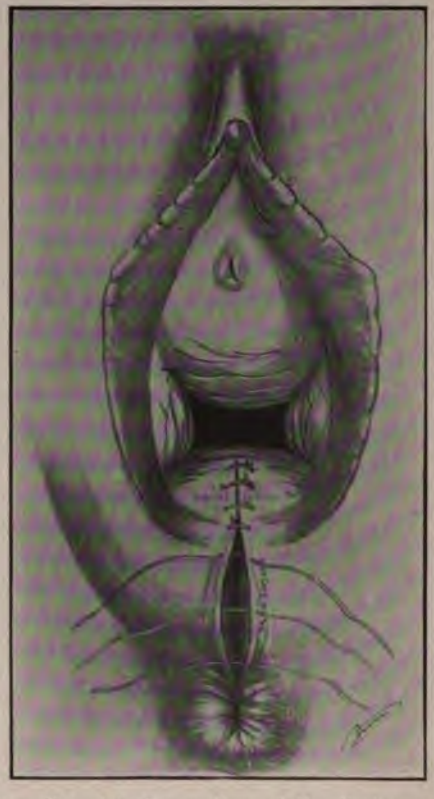


Fig. 64.—Median Complete Laceration of the Perineum. Rectal and Vaginal Sutures Tied, and Skin Sutures Placed. (Third and Fourth Steps.)

opposed surfaces at the angles and bottom of the wound, and partly from contraction incident to the process of cicatrization. The parts should be thoroughly scraped with a curette or sharp scalpel, and the cicatrizing margins trimmed away with scissors. With the removal of the binding surface of granulations and cicatrizing tissues, the wound

spreads out to something like its original dimensions. The opposing surfaces should now be brought together in the manner described for the immediate operation. Owing to the friability of the tissues, the sutures should be set out farther from the margin of the wound than usual, to avoid their cutting out.

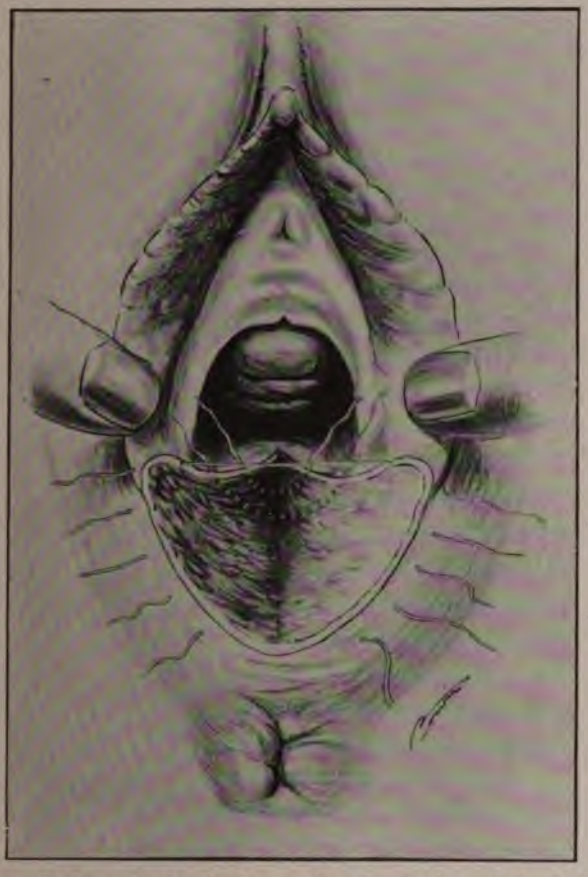


Fig. 65.—Perineorrhaphy for Incomplete Laceration of the Perineum. (Hegar's Operation.)

Secondary Operation.—In neglected cases of laceration of the pelvic floor it occasionally becomes necessary to repair the rent months or even years after the receipt of the injury. In such cases as already intimated the parts have undergone marked changes in size and appearance and the raw surfaces have become clothed with mucous mem-

brane. In order to restore these to their natural condition, it will be necessary to dissect off the adventitious covering and bring together the opposing raw surfaces. Various expedients have been resorted to for effecting this result, but the two now in vogue are by removing

Fig. 66.—Parkinson's Ether Inhaler.

the mucous covering with knife or scissors, thereby sacrificing tissue, or by what is known as the flap-splitting operation, in which no tissue is sacrificed. In this latter the mucous membrane is dissected from the underlying structures by insinuating a knife or scissors

Fig. 67.—Esmarch's Chloroform Inhaler.

under it until a sufficient area has been denuded, when it is lifted up as a curtain while the raw surfaces beneath it are brought together by suture.

Of the extent and configuration of the freshened surfaces for the repair of the pelvic floor there is ample variety, for almost every

operator of note has his peculiar views on the subject. As the essential object of the operation is to restore as near as may be the pelvic floor to its primitive condition, the freshened surfaces should be those that have sustained injury. The vast majority of tears are in the median line, increasing in depth from their starting-point up in the vagina to their exit on the perineum. Hence, if spread out they would be triangular in outline, with the base at the perineum. These require a triangular denudation, with the base at the perineum and

Fig. 68.—Lenniker's Leg-holder.

the apex on the middle line of the posterior vaginal wall. In other instances the tear has branched off into the sulci on one or both sides of the vagina. Here it will be necessary to denude a triangle for either sulcus, and a broad area at the vaginal outlet upon which these triangles are set and into which they are merged. In other words, there are two triangles to denude, one for either sulcus; but, as they overlap each other near the outlet, the outlines of the denuded surface resemble an inverted W. Inasmuch as the median incom-

Fig. 69.—Tenaculum.

plete tear of the perineum is fraught with no evil consequences, it is seldom subjected to the secondary operation for repair. In case operation is desired, the Hegar operation is best adapted to such. (Fig. 65.)

In secondary operations for laceration of the perineum, as also the intermediate operations, the patient will require an anesthetic. For this purpose ether or chloroform may be used, though my personal preference is for ether. Anesthesia is facilitated by specially devised inhalers. These operations should always be performed on

a table, the patient being placed in the dorsal position opposite a good light with the perineum flush with the end of the table. The legs should be flexed and somewhat separated and held by assistants or leg-holders. As a preliminary the bladder and bowels should be emptied and the field of operation rendered aseptic by cleansing. The instruments needed will be several tenacula, scissors, needles, needle-holder, and suture material. Besides these there should be an irrigator and sponges. There should also be some device for carrying off the waste fluid, such as a Kelly pad.

Secondary Operation for Median Complete Laceration of the Perineum.—The first step in the operation is to locate the ends of the retracted sphincter ani muscle, and to lay them bare by lifting up and clipping away the overlying tissue. Next, the sharp cicatricial edge of the recto-vaginal septum, which here forms the anterior border of the anal outlet, is trimmed away from one side to the other. Care must be taken not to wound the healthy mucous membrane of the

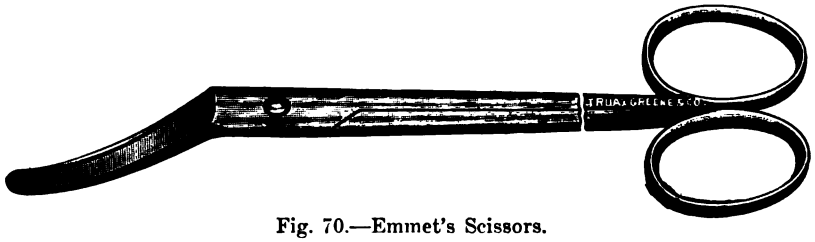


Fig. 70.—Emmet's Scissors.

rectum, as it is apt to bleed persistently. The septum should be beveled on the vaginal aspect, to increase the area of freshened tissue for coaptation. The next step is to denude a triangular surface on either side, extending from the sphincter to the inferior caruncle on the skin border and thence in a direction upward and inward to the apex of the septal tear in the vagina. The denudation should extend above the upper angle of the tear at least a third of an inch, and an equal margin of freshened surface should skirt its lateral borders.

The first suture is introduced on the skin surface somewhat inside of and back of the end of the sphincter-muscle, and carried upward through the septum to the upper angle of the denuded surface in the vagina, where it emerges. The needle is reintroduced at its point of emergence, and passing through the septum downward and outward comes out on the skin surface under the other end of the sphincter at a point corresponding to that of its entrance. A second suture is placed just outside of this nearer the end of the sphincter and follows

a course parallel to the first, but on a higher level. Not infrequently the needle may be passed the full length of the circuit without being withdrawn. It is a matter of little importance whether the succeeding sutures are passed from the skin surface or from both vaginal and skin surfaces just so that nice coaptation of the denuded surfaces is obtained. Special care should be taken to secure coaptation of the ends of the sphincter-muscle, for on this hinges the success or failure of the operation.

Fig. 71.—Kelly's Pad.

Laceration Extending up the Recto-vaginal Septum.—Extensive tears of the recto-vaginal septum demand separate attention before the sphincter can be repaired. Here it will be necessary to denude both margins of the tear from the vaginal side, seeing to it that a sufficient breadth of freshened surface is secured on both sides to insure firm union. The denudation must slant down to, but not include, the rectal mucous membrane, lest troublesome hemorrhage result. The sutures may be introduced from the vaginal side, commencing a little above the upper angle of the tear and proceeding downward to within a short distance of the sphincter. They should dip down to, but not

include, the mucous membrane of the rectum, and be placed at intervals of one-fifth of an inch. The better plan is to use a series of half-deep interrupted catgut sutures on the rectal side including the sphincter (Fig. 63), followed by a line of silk-worm gut sutures on the vaginal side, then repair the skin surface in the usual way. (Fig. 64.) A silk-worm gut suture should reinforce those of the sphincter.

Partial rupture of the sphincter-muscle, whereby its action is weakened, but not entirely destroyed, is evidenced by an inability to control liquid feces. Inspection will reveal the usual signs of a broken and retracted sphincter external to the thin circle of sphincter-fibers which form the anal ring. Here it will be necessary to locate the ends of the broken fibers, denude, and bring them together as in the case of complete rupture.

The Ristine Operation.—Dr. C. E. Ristine, of Knoxville, Tennessee, has devised an operation for complete laceration of the perineum which has the advantage of converting the rectum into a seamless tube, and thus obviating the possibility of fistulous tracts and greatly diminishing the risks of infection of the wound surfaces. His technique is as follows: Dissect a flap from the vaginal mucosa long enough to extend from the apex of the rectal tear to below the sphincter ani when turned into the rectum, and wide enough to leave a denuded surface on the vaginal side equal to the extent of the laceration. This flap is dissected from the periphery of the previously outlined or predetermined area (see Plate VI, Fig. 1) to the margin of the rectal tear, where it is left attached (hinged, as it were). The dissection should extend far enough down along the anal margin to uncover the ends of the sphincter ani muscle. This flap should be inverted into the rectum and a forceps attached to its apex, so that it may protrude from the anus when the ends of the sphincter are approximated by sutures, which are introduced in the usual way. One of these sutures should pass through this flap to keep it from retracting. The complete laceration is now converted into an incomplete one and is closed as in the ordinary Hegar operation. (See Plate VI, Fig. 2.)

PLATE VI.

Fig. 1.—Showing Outline of Incision.

Fig. 2.—Reinforcing Sphincter Suture Tied and other Sutures in Place.

CHAPTER XIII.

INJURIES TO THE PELVIC FLOOR—LATERAL LACERATIONS; RESULTS.

LATERAL LACERATIONS OF THE PELVIC FLOOR.

HERE the laceration follows the line of the vaginal sulci. It usually involves both sides, but not equally. For reasons already cited (the position of the child's head and the direction of the expelling force) the left side usually suffers most. When the occiput impinges on the right side of the pelvis the corresponding sulcus is more deeply lacerated. The sphincter ani often escapes injury in this form of laceration, for the reason that the tear extends along the sides of the rectum. The skin, however, is frequently torn in the median line, because of the convergence of the sulci at the vaginal orifice, and this may extend into the sphincter. As a rule, however, it stops short of this or passes to one side of the sphincter on account of the loss of support from the torn sulci above. In other words, there is less resistance at the sides where the supporting tissues have been broken down than is offered by the ring of intact muscle-fibers which constitute the sphincter. In this, the most serious of all tears of the pelvic floor so far as the ulterior results are concerned, the supporting power of the pelvic floor is practically destroyed. Should the laceration be limited to one side the effect is not so general, and the pelvic soft structures may still retain a very considerable degree of retentive power. The parts usually involved in the laceration are the levator ani, sphincter vaginæ, and transversus perinei muscles and the pelvic fascia. In time the mucous membrane and skin become bridged over and healed, thus obliterating the superficial indications of the tear. Nevertheless, through retraction of the muscles and fascia a gap is left on one or both sides of the pelvic floor which, though not obvious to the eye, may be easily recognized by the effects.

Under normal conditions there is an all-pervading evidence of muscle tonicity and firm coaptation of the structures of the pelvic floor and the outlets thereto: the anus and vagina. The anal cleft is deep and the anus retired, being drawn upward and forward. The distance from the anus to the fourchette or from the anus to the meatus is comparatively short. The perineum is slightly convex. By separating the labia, the anterior and posterior vaginal walls are

found to be in contact. If the vulva is pricked by a needle the anus is drawn upward and forward, the perineum shortened, and the vaginal outlet still more firmly closed. If the woman strain or bear down, the vaginal orifice closes firmly and the perineum bulges; there is no rolling out of the vaginal walls. A finger introduced in the vagina and pressed in different directions, backward and forward, encounters firm resistance as of an encircling band immediately within

Fig. 72.—Relaxed Perineum, the Result of Lateral Lacerations of the Perineum.

the ostium vaginæ. All this indicates the integrity and unimpaired tonicity of the muscular structures.

Relaxed Perineum.—Compare the above with this and mark the difference between the normal vaginal outlet and the *relaxed* outlet which is found in connection with the lateral laceration of the pelvic floor. Here the cleft of the buttocks is shallow, flattened, and broad. The anus drops backward, is pouting and relaxed. The distance between the fourchette and the anus is increased, often-

times doubled. The skin perineum may be intact or torn. When not torn it is preternaturally long, and is apt to fall in wrinkles about the vaginal orifice. The vaginal orifice is loose and gaping. It has been compared by Emmet to the mouth of a bag without its draw-strings. On separating the labia the loose and flabby walls of the vagina protrude into the opening. If the patient be directed to bear down, the vaginal walls roll out, and, if a finger be placed on the cervix, that too will be found to descend in the axis of the vagina. By seizing the perineum between the thumb and finger of both hands it may be drawn up over the vaginal outlet, even at times as far as the clitoris. (Fig. 72.)

With the patient in the left lateral position, if the right buttocks be lifted up, the air rushes in with an audible sound, the flabby walls are forced asunder, and a large, lax-walled opening appears in the pelvic floor. If the finger be pressed into the vaginal sulcus, it will meet with little resistance and drop into a groove between the rectum and pelvic wall. This indicates the rent in the levator ani muscle, and is the essential feature of the lesion. When one side only of the levator ani has been torn, the contrast between the two sides will be very obvious. In highly sensitive patients with active reflexes, the degree and character of the injury may not be made manifest without the aid of an anesthetic, as the unbroken fibers may by increased energy supply the defect occasioned by the broken ones. The hymen is often less injured in the class of cases under consideration than in normal labor. The most aggravated cases of relaxed vaginal outlet are generally the result of repeated childbirth, each successive birth adding to the sum of pelvic injury.

Operation.—For the repair of the injury just described the Emmet operation is not only the most rational, but from a practical standpoint meets the requirements better than any other devised. The object here is to diminish the vaginal outlet, give to it its natural direction, and restore its proper tone. This can only be done by exposing the torn fibers in the vaginal sulci and reuniting them by suture. The rent in the pelvic fascia will be closed at the same time. To accomplish this a broad base of denudation an inch or more in width, and extending from the caruncle on one side to that of the other, is surmounted by two triangles set side by side and extending up the vaginal sulci. The general effect is as seen in Fig. 73. To determine the extent of this denudation more definitely, a point is selected on either side of the vaginal orifice at the base of the hymen, which when drawn together by tenacula will restore the orifice to its normal

virginal dimensions. This point will usually be in the vicinity of the caruncles or the orifices of the vulvo-vaginal glands. These points are fixed by tenacula, which are given into the hands of an assistant. Now, by separating the labia and making outward traction on the tenacula, the bulging surface of the posterior wall of the vagina (the

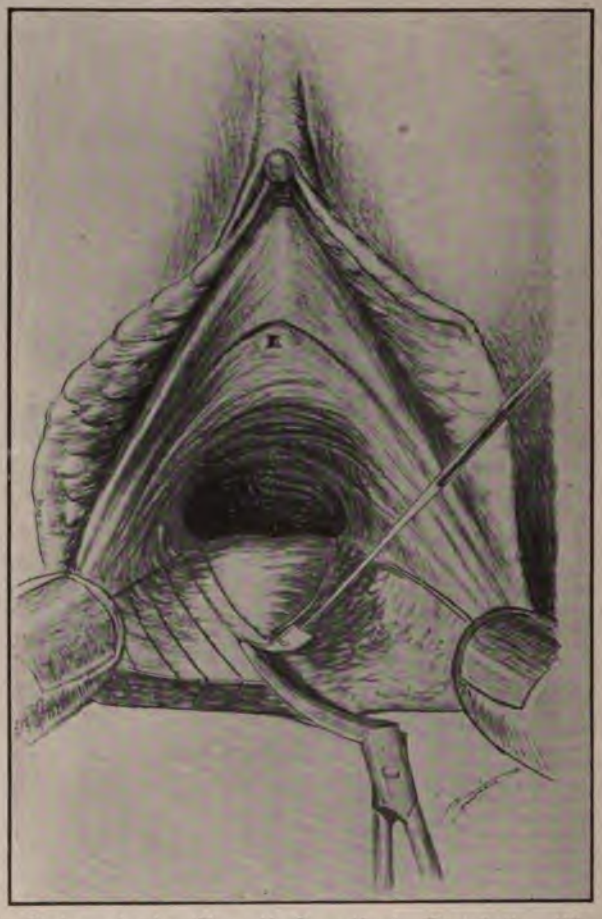


Fig. 73.—Perineorrhaphy (Emmet's Operation). Denudation (First Step).

rectocele) will come into view. A third tenaculum is hooked into the crest of this in the middle line. More correctly speaking, the tenaculum should be hooked into the rectocele at such a height as will admit of its being drawn to the vulvo-vaginal orifices on either side. These three tenacula furnish the guides for the denudation.

By drawing the rectocele to one side and making traction on one of the tenacula in the opposite direction, a triangular space will be exposed with its apex looking upward into the vagina. This space covers the vaginal sulcus of that side and indicates the area of denudation. The apex of the triangle is usually an inch or more farther up the vagina than the point where the middle tenaculum is inserted. By pulling the rectocele in the other direction the other triangle is exposed.

To insure nice coaptation and perfect outline it is better to mark out the area to be denuded with a sharp knife. Commencing at the tenaculum on one side just inside the hymen, an incision is carried to the tenaculum on the other side along the line of junction of the skin and mucous membrane. Then, by exposing one of the triangles by drawing aside the rectocele, the knife is carried upward along the outer side of the triangle to its apex, then downward along the inner side to the middle tenaculum. The other triangle is exposed and outlined in the same manner, giving the general effect of two triangles set upon a broad base. This base in itself represents a truncated triangle.

It matters little how the denudation is effected just so that no islands of epithelial clad surface are left in the area of denudation. For the beginner, it is better to commence at the bottom and work upward, thereby avoiding the flow of blood over the field of operation and the obscuration incident thereto. It is sometimes quite difficult to distinguish the denuded from the undenuded surfaces; consequently it is safer to pursue some methodical course in freshening the surfaces. The mucous membrane is removed in strips. Being caught up by a tenaculum or tissue forceps, it is cut away with scissors. Expert operators will frequently remove the entire surface in one continuous strip as one would peel an apple. The hemorrhage, which is usually quite free, either ceases spontaneously or is easily controlled by the suturing which follows. Arterial bleeding should be controlled by forcipressure, or, if persistent, by fine catgut ligatures.

Sutures.—The method of introducing the sutures is no less important than that of denudation. There are three cardinal sutures upon which will depend the efficiency of the operation, and to which all other sutures are subsidiary: one for each sulcus and the crown, or gathering, suture at the vaginal orifice. These should be of silkworm gut. If, as is generally the case, the left sulcus is to be sutured first, a silk-worm gut suture is passed at a point somewhat below the

middle of the denuded triangle of the sulcus. This triangle, it must be remembered, has its base on a line with the tip of the denuded central tongue, and its apex at the highest point of denudation in the vagina. This suture must not be passed straight across from side to side of the denuded strip, but in the form of a V with its apex

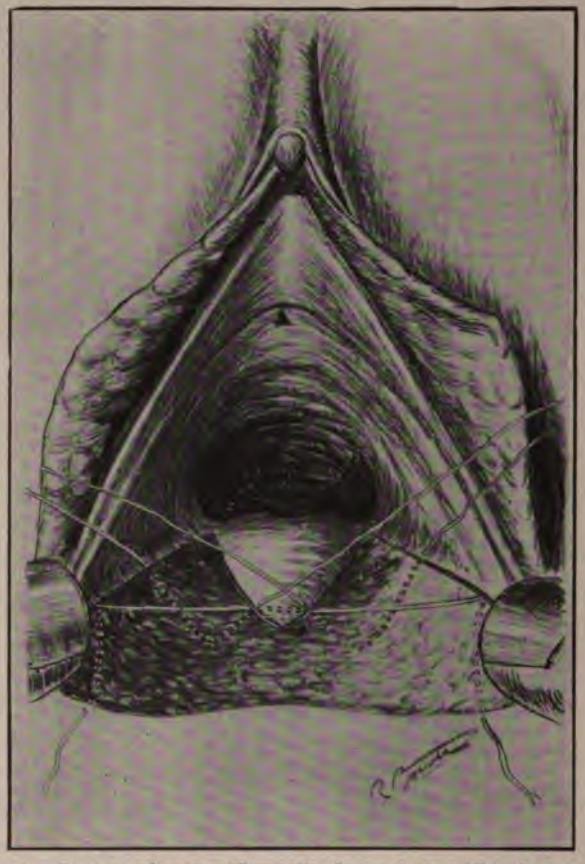


Fig. 74.—Perineorrhaphy (Emmet's Operation). The Crown and V-Shaped Sutures in Place (Second Step).

toward the vaginal outlet. The needle is entered on the mucous surface near the lateral wall of the vagina, and is given a direction downward, emerging at the bottom of the sulcus nearer the operator than at its point of entrance. It is re-entered at or near the same point, and passing upward emerges on the mucous membrane of the central

undenuded tongue at a point on a line with that of its original entrance. The object of this suture is twofold: to close in the denuded area, thereby bringing the torn muscular fibers together, and to lift up the pelvic floor by virtue of the V-shaped loop which embraces the sagging muscle-fibers at a lower level than if passed directly from side to side. This suture is tied immediately. This will leave a gapping elliptical space above, which may be closed by straight-across catgut sutures placed at sufficient depth to bring the underlying tissues into nice apposition. These latter sutures can be passed more conveniently in order from below upward.

By making traction on the silk-worm gut suture the part immediately above it can be brought within easy reach, and the first catgut suture introduced and tied. Now, by using this as a tractor, the succeeding suture is placed and tied, and so on to the end. The opposite sulcus is closed in the same way, with the exception that the needle is, or may be, introduced from the median, instead of the outer aspect of the denuded area. A few additional sutures may be needed to check bleeding. When extensive denudation of the sulci has been practiced, an additional catgut suture may be required below the silk-worm gut suture.

The crown suture of silk-worm gut is passed from the outer aspect of the upper angle on the side under the raw surface to the mucous membrane of the vagina opposite, across to the central undenuded tongue, thence outward in inverse order to the point on the opposite side corresponding to its point of entrance. (Fig. 74.) After tying this suture and placing another silk-worm gut suture in the middle of the wound on the skin surface, a few additional catgut sutures to insure nice coaptation completes the operation. The external, non-absorbable sutures are to be removed in from eight to ten days, and others in two or three weeks. The bowels should be kept soluble, and the patient confined to her bed for at least two weeks.

CONCEALED LACERATION OF THE SULCI.

In that class of cases in which the deeper structures of the sulci have been lacerated without injury to the skin or mucous membrane repair is as imperative as in the more common form, where the tegumentary structures are involved. Here it will be necessary to expose the muscle-fibers by removal of the mucous membrane, as described above, after which the sutures should be applied as there directed.

The Flap-splitting Operation.—This operation, while neither so scientific nor thorough as the Emmet operation, is, nevertheless, very efficient; it is easily and quickly executed and extensively practiced. It consists in dissecting the mucous membrane of the vagina from the underlying structures, lifting it up as a curtain, and uniting the muscles and fascia beneath it. As originally practiced by Tait, it was quite superficial, but, as now practiced by the majority of operators, it vies with the paring operation in the extent of denudation and in the area of muscle and fascia which are brought into apposition. The only essential difference between this and the paring operation lies in the fact that in the latter the mucosa is pared away, whereas in this it is merely loosened from its attachment and lifted up while the muscles are united by suture. In this way there is not necessarily any loss of tissue, though many operators are in the habit of excising the redundant mucosa. In performing the operation it

Fig. 75.—Knee Scissors for Flap-splitting Perineorrhaphy.

is not only necessary that the base line of incision (that toward the outlet) should be indicated by landmarks, but that the tissues should be put upon the stretch to facilitate dissection.

Two tenacula are placed on opposite sides of the vaginal orifice just above the orifices of the vulvo-vaginal glands (near the inferior caruncles), and a third is hooked into the mucous membrane at its junction with the skin in the median line of the posterior vaginal wall. The parts are put upon the stretch, and with a pair of sharp-pointed knee scissors the mucous membrane is snipped immediately under the middle tenaculum. The sharp-pointed scissors are now pushed up between the rectum and vagina for a distance of an inch or an inch and a half, the blades separated, and forcibly withdrawn. The scissors are now run right and left along the muco-cutaneous line as far up on the sides as the tenacula, and the curtain of mucous membrane lifted up. A few snips by the scissors completes the dissection. (Fig. 76.)

While the base line of the dissection follows, for the most part, the muco-cutaneous junction, it is important to remember that it must terminate inside of or on a higher level in the vagina than the orifices of the vulvo-vaginal glands; otherwise they will be included in the denuded area, with most unpleasant results. Should their orifices be occluded, a retention cyst will ensue; otherwise an irritable fistulous opening, or practical failure of the operation through non-

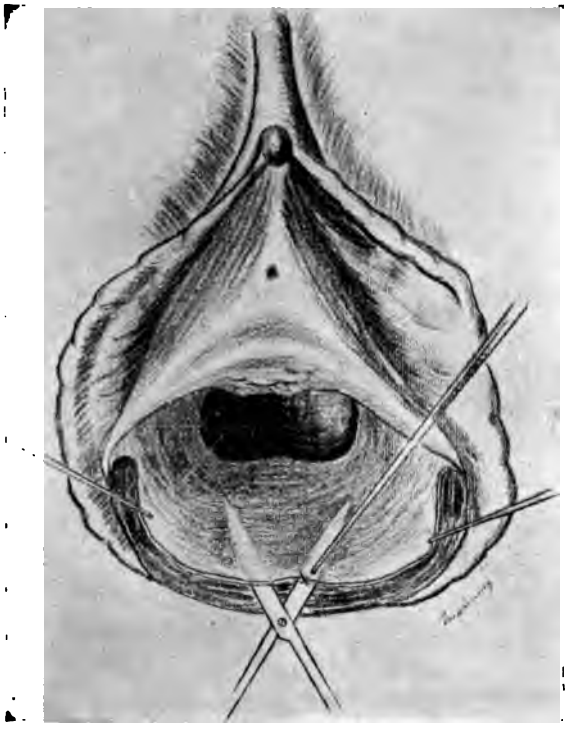


Fig. 76.—Perineorrhaphy. (Flap Operation First Step.)

union by reason of the extravasated secretions between the denuded surfaces. The tenacula are now readjusted, two being placed on the mucous membrane above and two on the skin margin below. These are, respectively, placed midway between the median line and the extremities of the incision for either side. These, when pulled in opposite directions, change the contour of the wound into a rectangular oblong.

While the mucous membrane is held up, a series of silk-worm gut

sutures are introduced to bring the opposing muscular surfaces together. The first suture is entered on the skin surface near the lower angle of the wound, passes through the muscle on that side, emerges near the bottom of the wound, crosses over to the muscle on the opposite side, and passing through it emerges on the skin surface at

Fig 77.—Perineorrhaphy. (Flap Operation. Second Step.)

a point opposite that of its entrance. Other sutures are introduced at intervals of half an inch until the upper limit of denudation has been reached. These are tied in the order in which they were introduced. (Fig. 77.) A flap-splitting Emmet operation may be made by dissecting a little farther up into the sulci, cutting away the flaps to correspond with the Emmet denudation, and introducing the sutures as in that operation.

The redundant mucous membrane, which at first makes a bulky mass on the posterior vaginal wall, gradually undergoes retraction until in many instances it ceases to give annoyance. Where it is desirable to remove it, it may be done by catching it up in fold by long-jawed forceps and cutting away all that portion projecting from the forceps. This will be in the shape of a triangle, and may be taken from the median line or from the region of the sulci, as seems best. The edges are united by fine catgut. The silk-worm gut sutures may be allowed to remain for two or three weeks.

Where the sphincter is torn, the ends of the muscle are exposed by an incision extending from the main incision diagonally downward and outward. The first suture is passed so as to bring the two ends of the sphincter together, and this is reinforced by a second just outside of it. The other sutures are placed as described above. Should the recto-vaginal septum be torn, it must be sutured on the rectal side down to the sphincter.

RESULTS OF LACERATION OF THE PELVIC FLOOR.

The most constant and noteworthy of the results following lacerations of the pelvic floor are subinvolution of the vagina, prolapse of the vaginal walls and uterus, cystocele, and rectocele. These are, for the most part, confined to the lacerations involving the vaginal sulci.

SUBINVOLUTION OF THE VAGINA.

The vagina, in common with other parts of the genital tract, undergoes great changes in pregnancy whereby it is increased in volume, capacity, and capability of distension. After parturition it shares in the general retrogressive changes by which it is, in large measure, restored to something like its former dimensions. This process, which is known as involution, is sometimes interfered with by conditions of the general system, and by local lesions, such as are under consideration. The result is that the vaginal walls remain thick and heavy, soft and succulent, and oftentimes thrown into folds. This constitutes subinvolution. This condition may be ascribed to a persistent engorgement of the vaginal vessels. This engorgement, in its turn, is due to want of support of the vaginal vessels on account of the broken fibers and fascia of the pelvic floor. Defective innervation also plays a rôle in the production of this condition, and is traceable to the same cause.

Repair of the pelvic floor usually restores the normal equilibrium of the circulation and completes the process of involution. Where such a result does not follow, it may be necessary to remove redundant tissue from the anterior vaginal wall, and close the gap by suture.

PROLAPSE OF THE VAGINAL WALL.

It is but a short step from the condition just described to that of settling, or prolapse, of the vaginal wall. This may affect either or both walls of the vagina, and may represent any degree from a barely appreciable corrugation above the ostium vaginæ to that in which the vaginal walls crowd through the same and appear as a soft, tumorous mass at the vulvar cleft. This condition is frequently accompanied by a descent of the bladder and rectum, although it may occur independently of either. By introducing a sound into the bladder and a finger in the rectum it can be determined whether or not these organs are implicated in the descent. The treatment is to restore the pelvic floor, supplemented, if need be, by anterior colporrhaphy.

CYSTOCELE.

Cystocele is a prolapse of the posterior wall of the bladder, pushing before it the anterior vaginal wall. The appearance is identical with that of prolapse of the anterior vaginal wall. A soft, tumorous mass appears at the ostium vaginæ or protrudes from it. Occasionally it will only be manifest when the patient is standing or under physical exertion. By having the patient bear down it will be extruded and plainly visible. (Fig. 78.) To differentiate it from prolapse of the vagina—pure and simple—or from a vaginal cyst, a sound should be introduced into the bladder and its beak directed downward and outward. In case of cystocele the beak of the instrument will be plainly felt from the vaginal side, with only the normal thickness of the intervening walls between. It must be remembered that the bladder-wall can be easily depressed, and therefore no pressure should be exercised on the sound. A more certain method is to expose the cystocele with the patient on her back, and fill the bladder with a normal salt solution. An obvious swelling and distension of the sac make the diagnosis clear.

The subjective symptoms are a feeling of weight and fullness at the ostium vaginæ, with more or less bearing down. There is also a sensation as though the pelvic contents were escaping. Dysuria is a common accompaniment. In many instances the patient is annoyed

with a sense of incomplete urination, which arises from the fact that the urine occupying the vesical pouch is not expelled. This in time undergoes ammoniacal decomposition, irritates the bladder, and occasionally leads to cystitis. Many cases of irritable bladder are due to this cause. Some patients learn to relieve themselves and obviate

Fig. 78.—Cystocele and Rectocele.

this unpleasant feature of the trouble by holding up the cystocele with the fingers during the act of urination.

Treatment.—As the trouble originates in the absence of the normal support of the pelvic floor, the first and most essential factor in the treatment is to repair the same. With the pelvic floor restored

and the bladder sustained by its equable, upward pressure, the majority of cases will need nothing further. If, however, the pouch be very large and protuberant, the redundancy may be corrected by excising a sufficient area of the vaginal wall over the cystocele and uniting the edges by suture. Under a false impression as to the necessity and effectiveness of sustaining the bladder by retrenching the anterior vaginal wall, a great variety of methods has been devised. Unsupported by a good pelvic floor they all fail alike, and a few months finds the patient in the same condition as before the operation. It matters little, therefore, what method is used, as it is a temporary expedient at best. Two methods suggest themselves because of their simplicity and ease of execution. These are, respectively, the oval denudation with suture and the Stoltz method.

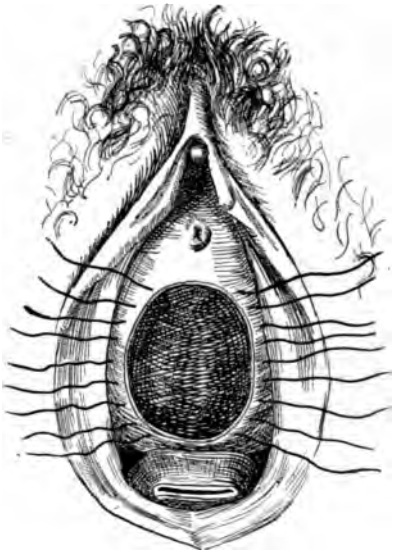


Fig. 79.—Operation for Cystocele by Oval Denudation.

Oval Denudation.—In this an oval area is denuded over the site of the cystocele, of sufficient size to embrace the redundant tissue. The long axis of this oval corresponds with the long axis of the vaginal canal. Interrupted sutures are passed from side to side under the denuded surface, and while the cystocele is pushed in toward the bladder along the middle line the sutures are secured. (Fig. 79.) This, for the time being, obliterates the vaginal pouch and throws it into the bladder.

Stoltz's Method.—In this a circular area is denuded over the site of the cystocele, which is surrounded by a single purse-string suture of strong silk. This is tightened and tied after the cystocele has been inverted and pushed in toward the bladder. (Fig. 80.) These methods are subsidiary to repair of the pelvic floor, and absolutely worthless without it. In these plastic operations the anterior colporrhaphy should precede the work on the posterior vaginal wall.

Goffe's Operation for Cystocele.—In this operation a transverse incision is made in front of the cervix, as in vaginal hysterectomy.

From the center of this a second incision is made at right angles to it along the entire length of the anterior vaginal wall. These incisions go through the fascia down to the bladder wall. After a free dissection of the entire base and sides of the bladder from the fascia, the vesico-uterine pouch is entered, and the peritoneum torn across the face of the uterus and well out on to the face of the broad ligaments. To correct the cystocele, the bladder is rotated on its transverse diameter and sutured as follows: A point is selected in the median line of the base of the bladder which, when carried up to the torn edge of the peritoneum on the middle, anterior surface of the uterus, will take up the slack in the base of the bladder. Through this point a chromicized catgut suture No. 2 is passed, and carried also through the selected point on the anterior surface of the uterus. This suture is left long and not tied. Two points are then selected, one at either side, on a transverse line with the first and about equally distant. Through these, similar sutures are passed and carried through a point on the peritoneal surface of either broad ligament, sufficiently wide at the middle line to take in all the slack in the base of the bladder from side to side. These sutures are also left long. The three sutures are then tied successively, beginning with the middle one. The effect of this is to stretch the base of the bladder taut and smooth in every direction. The redundant fascia and vaginal mucous membrane are then trimmed off sufficiently to make them fit the base of the bladder snugly, and are stitched with chromic gut.

Fig. 80.—Stoltz's Operation for Cystocele.

Watkins's Operation.—This operation is specially adapted to cases of extensive cystocele and uterine prolapse in women who have passed the menopause or who have been rendered sterile by operation. The object is to bring the uterus down through the anterior vaginal cul de sac and to pocket it between the anterior vaginal wall and

bladder. In this way it serves the double purpose of supporting the cystocele and preventing descent of the uterus.

The patient being placed in the lithotomy position, the cervix is grasped with a volsella and a crescentic incision made anteriorly at the cervico-vaginal junction. A second incision is carried from this along the median line of the anterior vaginal wall to within an inch or less of the meatus urinarius. (Plate VII.) This incision should be carried down to, but not injure, the muscular wall of the bladder. The bladder is next separated from the uterus by a finger covered with gauze and the peritoneum perforated, either by thrusting a finger through it or by snipping with the scissors. This opening should be stretched sufficiently to permit the delivery of the uterus through it. The firm attachment of the uterus to the bladder along its median line makes it safer in many cases to liberate the sides first. The anterior vaginal wall is now separated from the bladder by blunt dissection, first on one side of the median incision and then on the other. This dissection is facilitated by grasping the edge of the incision with a long-handled forceps and pushing off the bladder by gauze pressure. (Plate VIII.) These vaginal flaps should be sufficiently large to cover the uterus after it is brought into the vagina. The uterus is now delivered into the vagina and covered with the flaps. Two or three stitches at intervals of an inch or more, passed through the edges of the flaps and underlying uterus, secure the latter in place. (Plate IX.) The uterus should not be drawn down so far as to interfere with urination by pressure on the urethra, though it should be sufficiently low to give support to the cystocele. A continuous catgut suture along the line of incision completes the operation. (Plate X.) The after-treatment is such as is usual for vaginal operations. (Plate XI.)

The Author's Cystocele Operation.—This operation consists of:—

1. A denudation of the most prominent part of the cystocele.

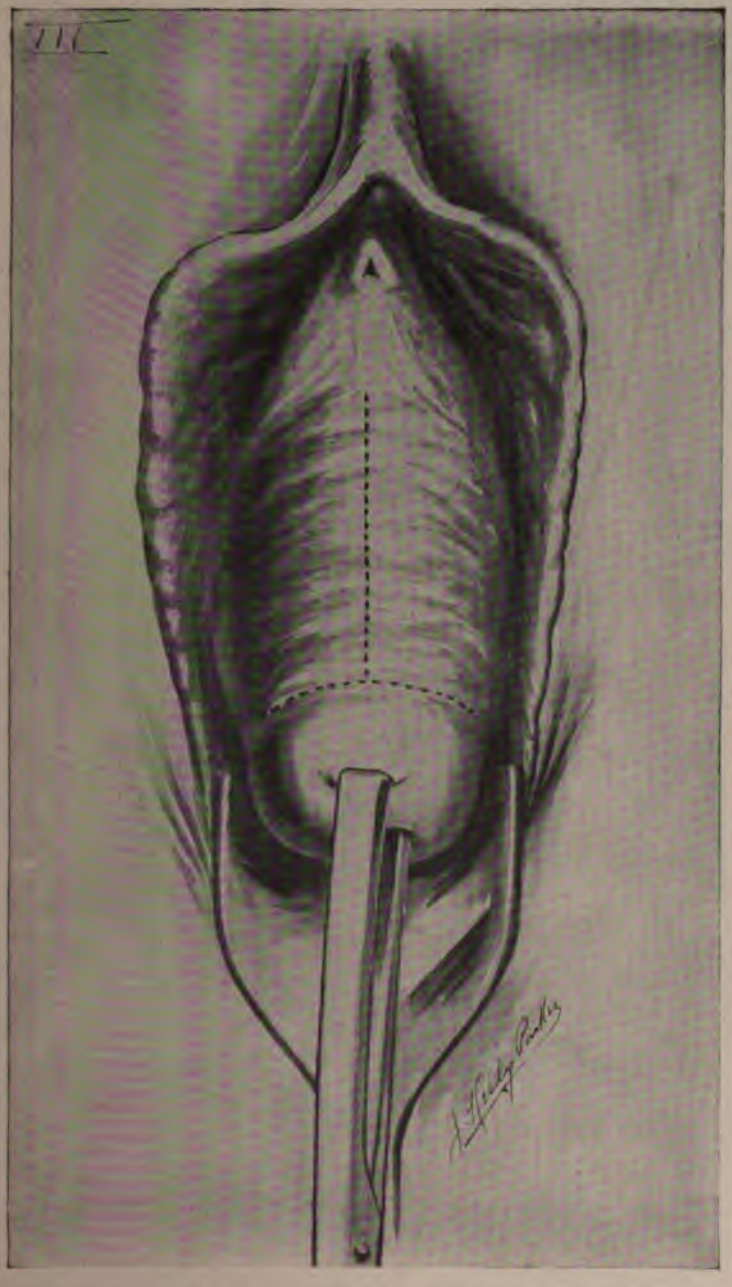
2. Dissecting flaps from the vaginal wall on either side of the denuded area with which to cover it.

3. Bringing the flaps together over the denuded area and suturing them to it and to each other.

Technique.—1. Lift up the redundant tissues and, by means of tenacula or tissue forceps, gather them into a longitudinal fold along the median line of the anterior vaginal wall.

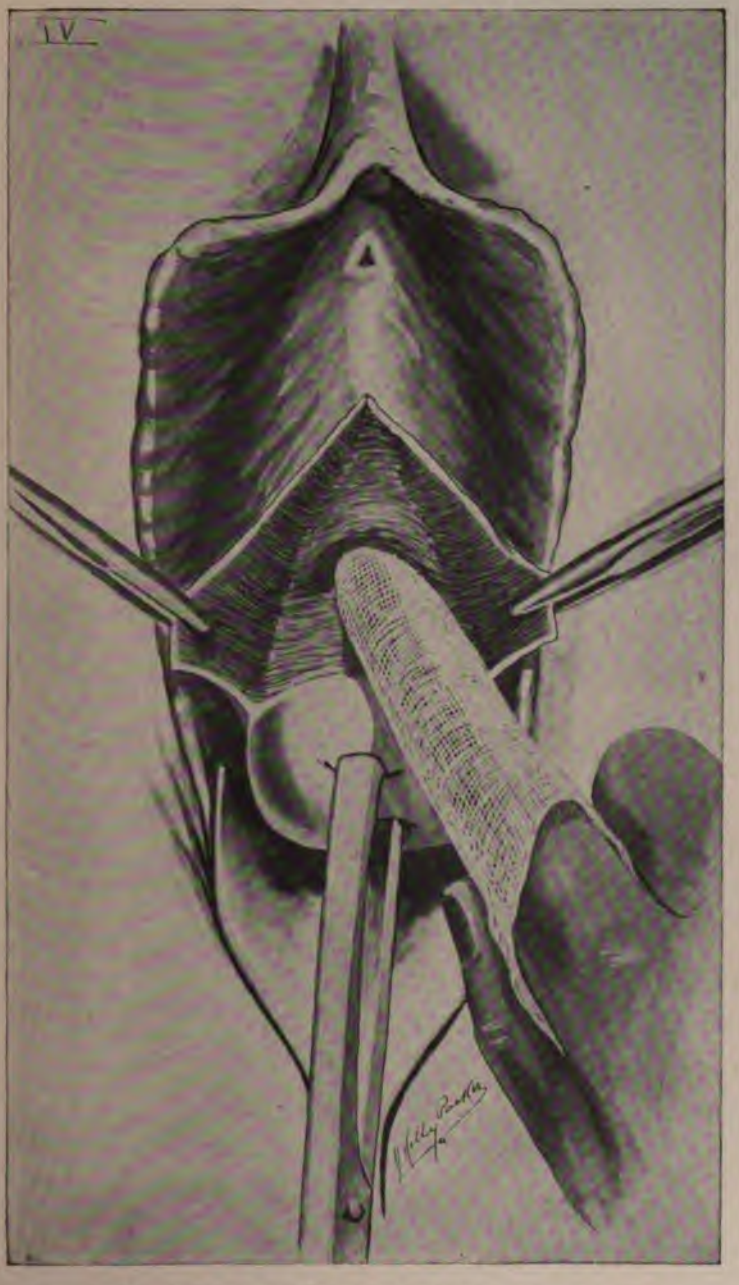
2. Make an incision on one side of and at the base of the fold at or near the median line. This incision should extend from within one-half an inch of one end of the fold to within a like distance of the other end.

PLATE VII.



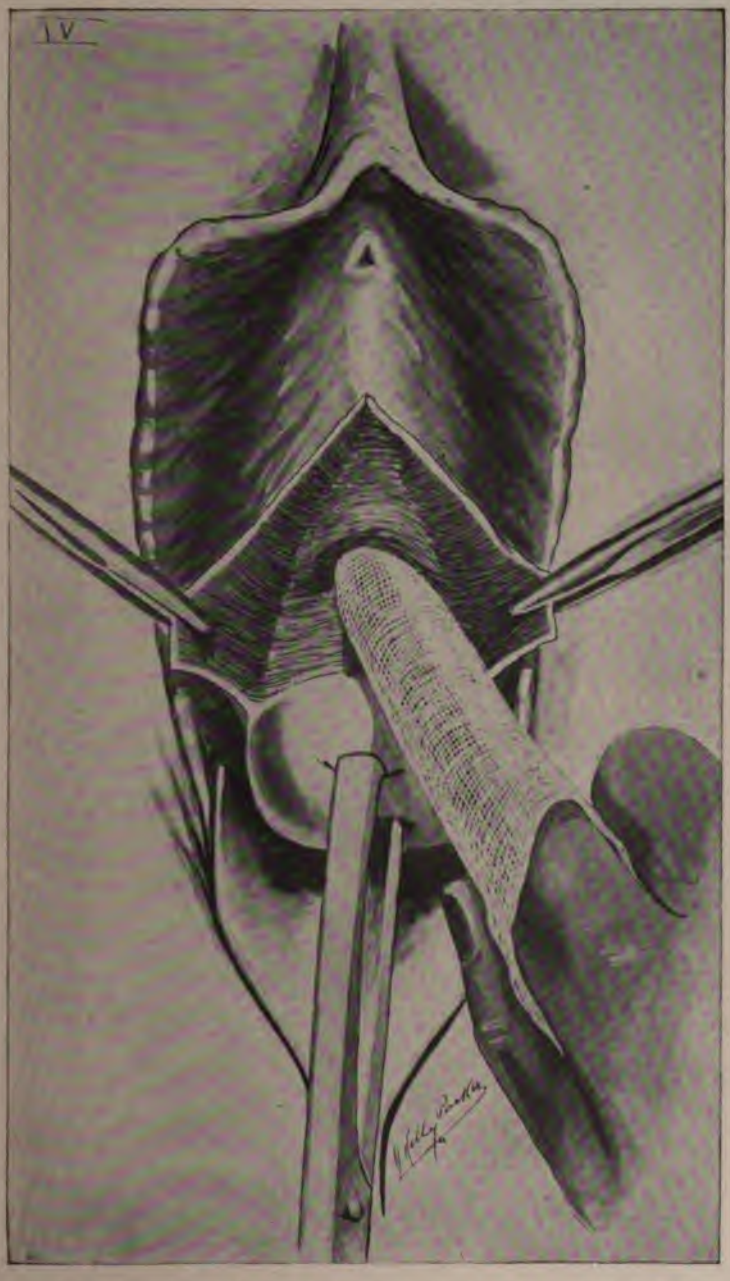
Showing Method of Making Transverse and Longitudinal Incisions.

PLATE VIII.



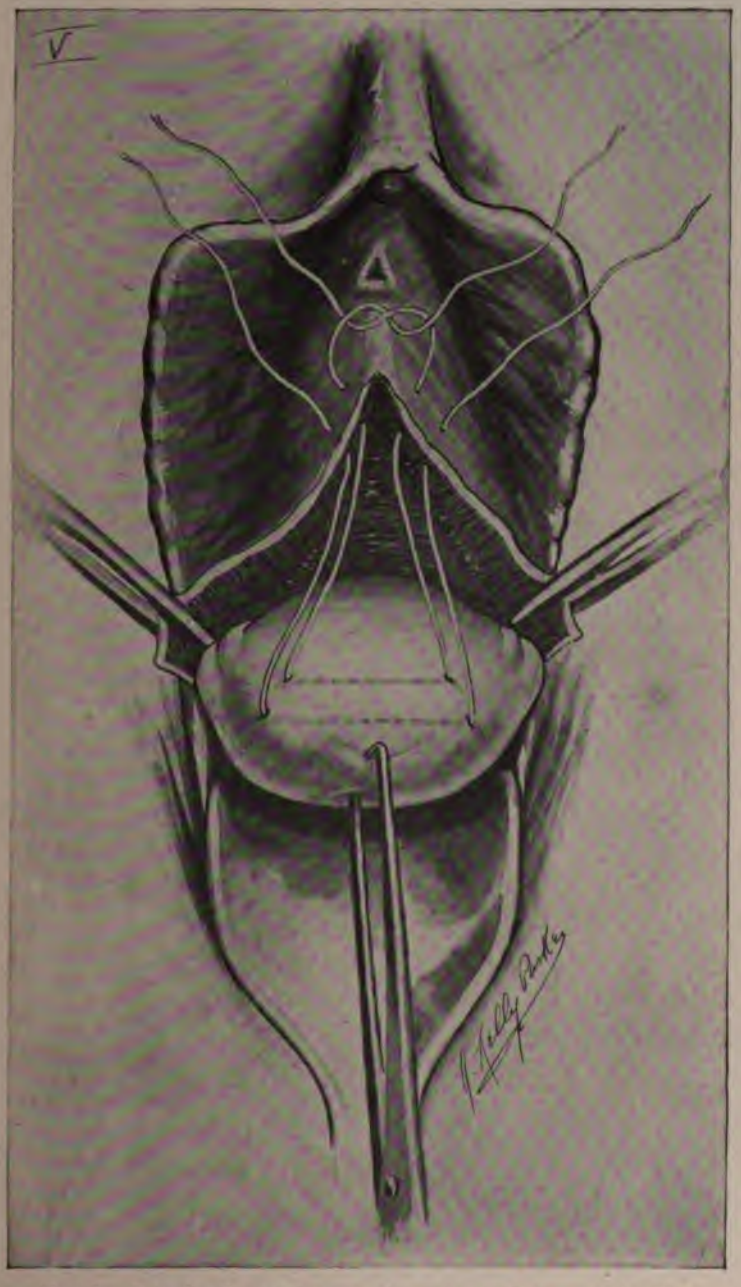
Showing the Method of Dissecting the Vagina from the Bladder.

PLATE VIII.



Showing the Method of Dissecting the Vagina from the Bladder.

PLATE IX.



Showing Introduction of Sutures through the Edges of the Flaps and Underlying Uterus.

PLATE X.

Continuous Suture of Anterior Vaginal Wall.

PLATE XI.

Sagittal Section, Showing Results of Operation.

3. Carry the incision down through the fascia to the muscularis of the bladder.

4. Make a similar incision on the other side of the fold.

5. By blunt dissection separate the bladder from the vaginal wall, from the incision outward to the sulci.

6. Convert the two separated layers of the vaginal wall into flaps, by cutting outward from the upper and lower extremities of the incisions toward the sulci.

7. Denude the area between the incisions.

8. Draw the flaps over the denuded area and suture them to it and to each other from below upward.

RECTOCELE.

A rectocele presents as a soft, tumorous mass on the posterior vaginal wall. It is caused by a pouching, or bulging forward, of the anterior rectal wall, which carries before it the posterior vaginal wall. In milder cases it is to be found within the ostium vaginæ, but in the severer forms it escapes through and appears at the vulvar cleft. (Fig. 78.) It is more conspicuous when the woman stands, and upon straining or bearing down. Women usually regard and speak of it as a falling of the womb. The primary cause is the want of support arising from laceration of the pelvic floor. The rectocele is of gradual formation, and is the result of yielding of the anterior rectal wall in the direction of least resistance in the act of defecation. Accumulated masses of fecal matter in the lower part of the rectum unopposed by the normal anterior resistance also act as a causative factor. In the act of defecation the rectocele crowds into or through the ostium vaginæ, much to the annoyance and discomfort of the patient. She feels as though the passages were going to escape in that direction. Her solicitude in this direction often impels her to make counterpressure with the fingers on the rectocele, and in this way she learns to facilitate expulsion through the natural outlet. Aside from the distressing symptoms alluded to above, and the apprehensions arising from a progressive increase in the bulk of the tumor, the residual fecal matter in the rectum is liable to give rise to inflammation and ulceration of the rectal mucous membrane.

Diagnosis.—The diagnosis is made by introducing a finger into the rectum, when the pouch will be easily detected.

Treatment.—Posterior colporrhaphy and perineorrhaphy, as in the Emmet or some allied operation, is the treatment for rectocele.

ENTEROCELE.

Enterocele is a prolapse of the intestine into the vagina. As in rectocele, the vaginal wall is carried before the advancing bowel. Cystocele, rectocele, and enterocele are, in reality, hernial protrusions into the vaginal canal. Enterocele is divisible into two forms: anterior and posterior. It is a rare affection, and the anterior form much less frequent than the posterior.

Posterior enterocele takes its starting-point from the bottom of Douglas's pouch. In its descent it crowds down between the rectum and the posterior vaginal wall, carrying the latter before it. It sometimes fills the vagina, or in aggravated cases may escape from the vulva. The contents are intestine or omentum, occasionally both. The cause is imperfectly understood. In some instances it seemingly depends upon a broken pelvic floor. An abnormally deep Douglas pouch has been assigned as a cause.

Anterior enterocele takes its starting-point from the vesico-uterine pouch. It descends along the anterior vaginal wall and between it and the bladder.

Diagnosis.—It may be diagnosed from a rectocele by palpation from the rectal and vaginal sides. Percussion and palpation will also differentiate it from a vaginal cyst. If it contain intestine it will be resonant; but if omentum, it may be distinguished by the absence of fluctuation.

Treatment.—The treatment consists in reducing the hernia when practicable, repairing the pelvic floor when necessary, narrowing the vagina, and such other plastic work as seems necessary to meet the requirements of each individual case. In some instances better results can be obtained by intra-abdominal surgery.

CHAPTER XIV.

GENITAL FISTULÆ.

GENITAL fistulæ are abnormal avenues of communication between the genital tract and adjacent hollow organs. The principal genital fistulæ are included under the heads: urinary and fecal.

Fig. 83.—Genital Fistulæ (Scheme).

1. Urethro-vaginal. 2. Vesico-vaginal. 3. Recto-vaginal. 4. Vesico-uterine. 5. Uretero-vaginal. 6. Entero-vaginal.

The urinary fistulæ are:—

1. Urethro-vaginal: between the urethra and vagina.
2. Vesico-vaginal: between the bladder and vagina.

3. Vesico-uterine: between the bladder and uterus.

4. Vesico-utero-vaginal: between the bladder and vagina by way of a channel through the uterine wall.

5. Uretero-vaginal: between the ureter and vagina.

6. Uretero-uterine: between the ureter and uterus.

The fecal fistulæ are:—

1. Recto-vaginal: between the rectum and vagina.

2. Entero-vaginal: between the intestine and vagina.

Causes.—The most frequent cause of genital fistula is prolonged and difficult labor, protracted pressure from the impacted fetal head being the paramount factor. Fistulæ from this cause are much less frequent than formerly, owing to the earlier use of the obstetric forceps and improved methods of expediting delivery. The old idea that the obstetric forceps was responsible for fistula has long since been gainsaid by irrefutable evidence, and the blame is now shifted to the deferred use of the instrument. Fistulæ may result from the awkward use of instruments; but these are usually lacerated wounds, and tend to heal spontaneously. Permanent fistulæ are usually the

Fig. 84.—Tenaculum.

result of sloughing from prolonged pressure. Incurable fistulæ occasionally result from cancer or tuberculosis of the genital tract. Vesical calculi and abscesses in the vaginal wall sometimes result in fistulæ, and sometimes they are produced, intentionally or otherwise, by surgical operations. A fistula not the result of sloughing tends to spontaneous closure.

Symptoms.—Incontinence of urine and the presence of urine in the vagina are the cardinal symptoms of urinary fistula. The vagina and vulva are continually bathed in the secretion, and the parts over which it flows, including the inner aspect of the thighs, are irritated, reddened, and oftentimes excoriated. The urinary salts, especially the lime salts, are deposited in the vicinity of the fistulous opening. The patient carries with her an odor of decomposing urine. When the fistulous opening is small or is situated above the ureteral orifices, the patient may be able to retain and void some urine *per vias naturales*. In ureteral fistula involving one side the urine in part escapes into the vagina and in part is voided from the bladder. The presence of fecal matter in the vagina and the escape of intestinal gases into and through the same are indicative of fecal fistula. When

the fistulous opening is very small, only the liquid feces will find their way into the vagina. The odor of a fecal fistula is even more revolting than that of the urinary fistula.

Diagnosis.—Incontinence of urine or fecal matter should always lead to careful investigation. In the recently delivered woman a sudden gush of urine five or six days after delivery, followed by permanent incontinence, is highly suggestive of urinary fistula. This is the period at which the slough is apt to separate, leaving a hole in the bladder-wall. Large fistulæ may be detected by palpation on the vaginal side, or by combining this with a sound in the bladder or a finger in the rectum. Smaller fistulæ may require both palpation and ocular inspection.

For vesical fistula the perineum should be retracted and the patient placed opposite a good light. Even here it may be necessary to inject the bladder with a colored fluid, noting the point at which it escapes into the vagina. Solutions of aniline or permanganate of

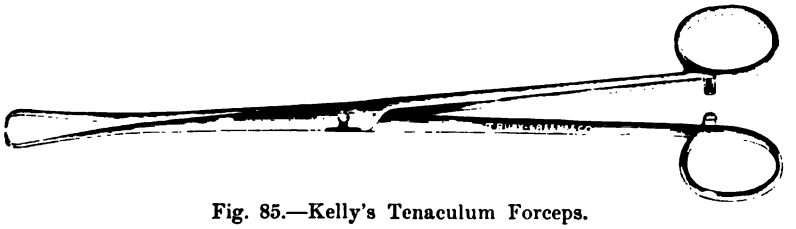


Fig. 85.—Kelly's Tenaculum Forceps.

potash, as also milk, are usually resorted to for this purpose. The milk should be sterilized and the solutions should not be stronger than is necessary to impart a deep tinge to the fluid. Small fistulous openings into the rectum may be disclosed in the same way.

In ureteral fistula, clear urine will continue to well up in the vagina after the bladder has been filled with colored fluid. Such an occurrence is, therefore, strongly indicative of ureteral fistula, and should lead to more precise investigation. Careful inspection of the vaginal vault, or at the base of the bladder, by the aid of retractors and illumination will sometimes reveal the opening. Inspection of the ureteral orifices in the bladder by the cystoscope or catheterization of the same, or the use of the Harris separator, whereby the secretion from each ureter can be accurately determined and compared, taken in connection with a urinary discharge into the vagina, renders the diagnosis clear. In the absence of these methods of precision, a diagnosis of reasonable certainty may be based upon a comparison of the amount of urine which escapes from the vagina and

that drawn from the bladder within a given period. After emptying the bladder, the patient is placed over a vessel for the space of two hours and then catheterized. If the amount in the vessel equals that obtained from the bladder, it is almost conclusive evidence of one-sided ureteral fistula.

Treatment.—Recent fistulæ the result of laceration or incision usually tend to heal spontaneously, and should be encouraged to do so by rest, cleanliness, and attention to such details as will abate inflammation and relieve tension. Cauterization, formerly so much in vogue, has fallen into merited disuse, except in very small and recent fistulæ which may sometimes be induced to heal after being touched by the thermocautery, or even after the use of some of the less potent caustics. Many and varied are the methods which have been resorted to from time to time for the closure of fistulous openings, some of which are applicable to fistulæ in general, while others are adapted to special conditions. The methods in general use to-day

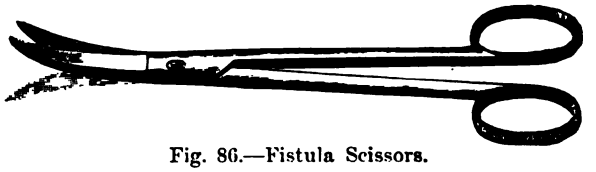


Fig. 86.—Fistula Scissors.

may be classified under four heads: denudation, flap-splitting, flap-inversion, and transplantation.

Preparatory Treatment.—In fistula, as in all plastic work, where success depends on perfect and immediate union, it is essential that all the conditions favorable to healing should be secured, if possible. The tissues contiguous to the fistulous orifice should be relieved from irritating influences, inflammation combated, indurations softened, tension relieved, and distortions corrected. For urinary fistula the urine should be rendered bland by the ingestion of large quantities of water, and by the exhibition of liquor potassa, benzoate of soda, or some other alkaline preparation. The urinary salts, which are apt to incrust and irritate the tissues in the vicinity of the fistula, may be dissolved away by a weak acid solution. Dilute nitric acid—℥ij to the gallon—answers the purpose nicely. Copious and oft-repeated injections of warm boric acid solution will generally subserve every purpose. Cicatricial bands should be cut and allowed to heal over a glass or metal plug or the vagina may be packed with gauze. Where a fecal and urinary fistula co-exist, the former should be repaired first

to prevent infection of the latter. Long-continued preparatory treatment is seldom called for nowadays, as most conditions which formerly baffled the skill of operators may now be easily surmounted by one or more of the various expedients with which we are familiar.

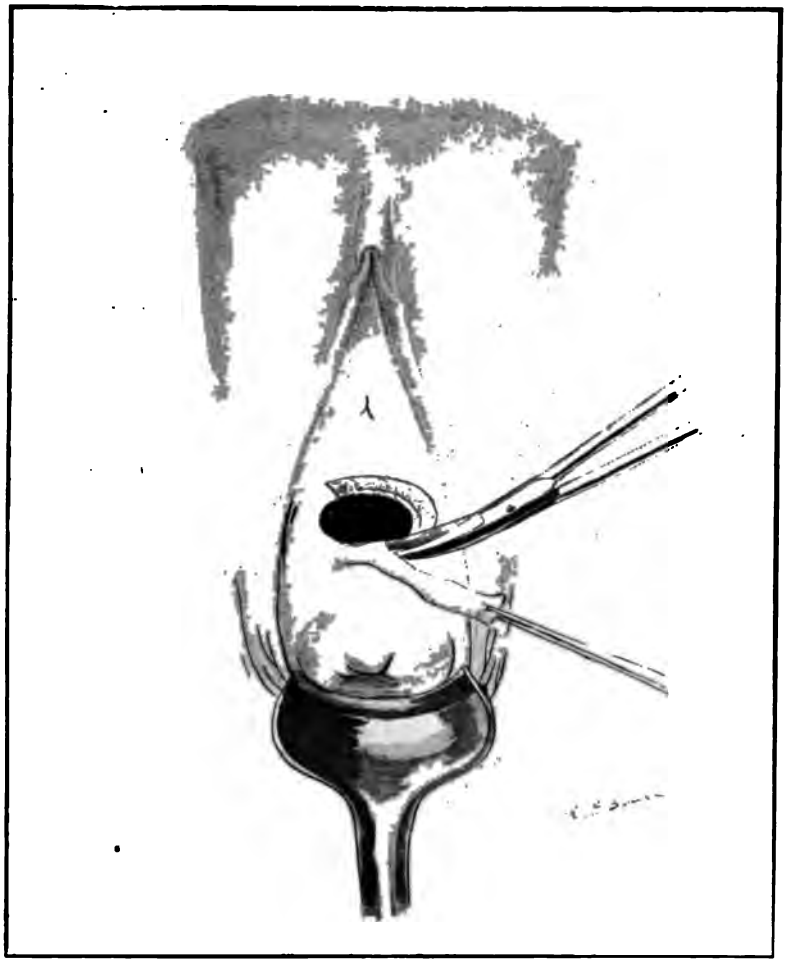


Fig. 87.—Vesico-vaginal Fistula. (Denudation Operation. First Step.)

Thus, a contracted vaginal orifice may be incised at the time of operation; a fistula which is drawn up and bound close to the pubic arch may be liberated by careful dissection, and the bladder may be dissected from the unyielding vaginal wall and drawn over the opening so as to close it.

Operative Technique.—The following points are to be observed in operation for genital fistula:—

1. The parts must be exposed by retractors under a good light and the patient placed in that position which will afford easiest access to the fistula.

2. The tissues surrounding the fistula must be made tense by properly adjusted tenacula to facilitate nice dissection.

3. The edge of the fistula at the point where the dissection begins should be caught up by the tenaculum or tissue forceps and held fairly taut while the strip is being removed.

4. The cicatricial edge of the fistula, when practicable, should be removed in one continuous strip.

5. The incision should be slanting from the vaginal to the rectal or vesical surface, so as to leave a beveled vivified surface for coaptation and union. This surface should be from one-third to one-half

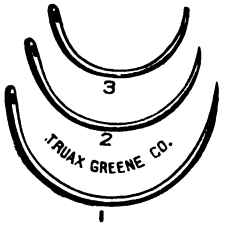


Fig. 88.—Fistula Needles.

of an inch in width, and made principally at the expense of the vaginal side.

6. Always avoid, if possible, wounding the rectal or vesical mucous membrane, as it is liable to give rise to troublesome hemorrhage. The incision should be carried down to, but not include, the mucous membrane.

7. In placing the sutures the needle should be passed down to, but not into, the rectal or vesical mucous membrane.

8. The sutures should be introduced in such direction and manner as to insure the easiest and most accurate approximation of the sides of the wound. The first stitches should usually be placed near the center of the wound, and sometimes two or more of them will converge from different points on the periphery of the wound to a common center. As a result, after these are tied, the initial opening is converted into two or more smaller openings, which may resemble a figure 8, a clover leaf, or a double figure 8, at right angles to each other. The resulting scar, after closure of the fistula, will

be represented by a line, straight or curved, running lengthwise, crosswise, or obliquely with reference to the vaginal canal, or by an X or Y.

9. It is better to avoid, when possible, the bringing together of three or more angles in the center of the wound, as it is apt to leave a leakage at the point of junction.

Operation by Denudation.—The classic operation of denudation and suture, as perfected by Sims, may be performed with the patient

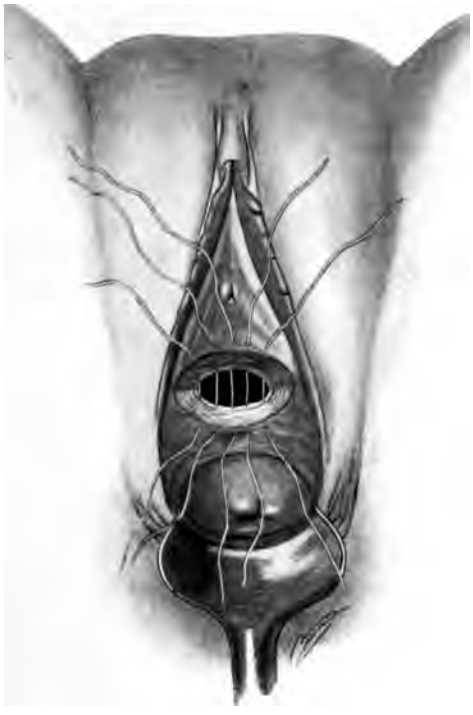


Fig. 89.—Vesico-vaginal Fistula. Denudation Operation (Second Step).

in the lateral or dorsal position. The exaggerated lithotomy position affords the best exposure of the anterior vaginal wall, and renders the fistula more accessible. The perineum being retracted and the edges of the fistula made tense by properly adjusted tenacula, the denudation is effected with knife or scissors. The edges of the fistula are denuded down to, but not including, the vesical mucous membrane. The vivified surface should be beveled at the expense of the vaginal side, and should be from one-third to one-half of an

inch in width. (Fig. 87.) The sutures are introduced in the direction that will produce the least traction on the tissues: longitudinal, transverse, or an intermediate direction with reference to the vaginal canal. Occasionally it will be necessary to bring the edges together in the form of an X, Y, or H, although it is desirable to avoid bringing angles together if possible. The needle is entered about one-fifth

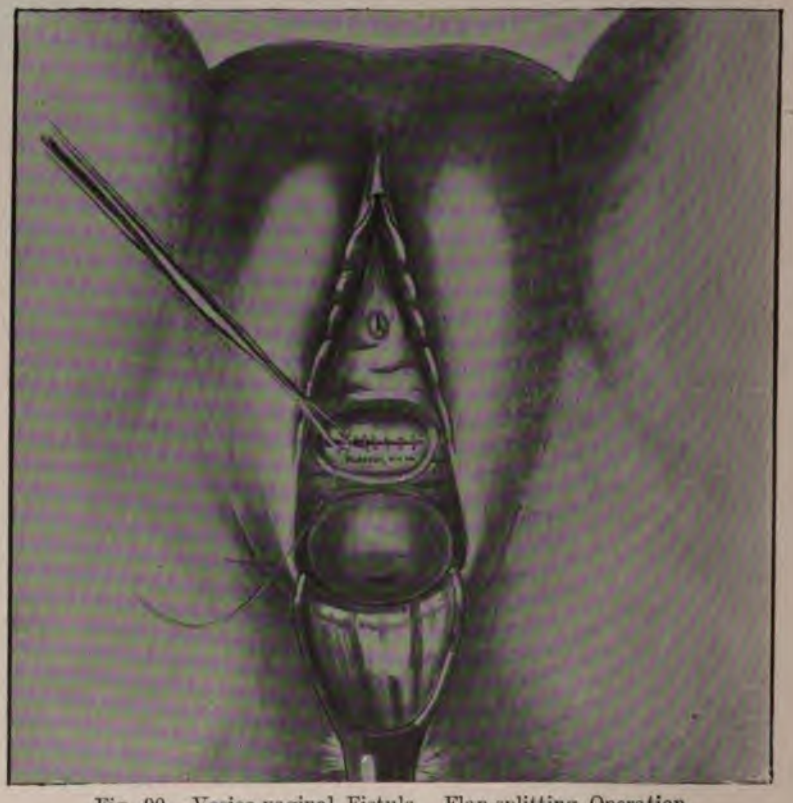


Fig. 90.—Vesico-vaginal Fistula. Flap-splitting Operation. Bladder-wall Sutured.

of an inch external to the edge of the vivified surface, and made to emerge at the inner edge of the same, care being taken not to penetrate the vesical mucous membrane. It is re-entered at the inner edge of the denuded surface opposite, and is brought out on the vaginal mucous membrane at a point corresponding to and opposite its point of entrance. The sutures are placed one-fifth of an inch apart. (Fig. 89.) Silk-worm gut makes the best suture material, although

silver wire, silk, or even catgut may be used on occasion. The bladder should be irrigated before securing the sutures, as clots of blood left in the bladder are liable to provoke tenesmus, and not infrequently choke the catheter. The sutures may be shotted or tied, and should not be drawn too tightly, lest strangulation of tissues ensue, with resultant pressure necrosis. When a ureteral orifice opens on

Fig. 91.—Vesical Fistula. (Ferguson's Operation. First Step.)

or near the edge of the fistula it should be turned into the bladder, or split up on the vesical surface to prevent occlusion. The sutures in the vicinity of the ureter should be adjusted with great care to avoid constriction of the duct. There is reason to believe that numerous fatal cases following the operation under consideration have been due to the inclusion of the ureter or ureteral orifice in the sutured wound.

Flap-splitting Operation.—The advantages of this over the classic operation just described are that no tissue is sacrificed by being cut away, and in the event of failure the condition of the patient is no worse than before. It also affords a broader surface of contact, and forms an elevated ridge in the bladder at the fistulous site, which increase the chance of firm union and diminish the chances of leakage. Another conspicuous advantage is that, in large fistula associated with unyielding walls, the pliable and elastic bladder-wall may be separated from that of the vagina and brought down over the opening. In this way fistulæ may now be closed that were formerly considered beyond the reach of surgical skill.

The simplest method of performing the flap operation, and that which is adapted to the majority of cases, is to render the edges of the fistula tense by properly adjusted tenacula, and to split or dissect the bladder from the vaginal wall to the depth of one-third of an inch. The raw margins of the bladder-wall are now united by catgut suture, over which the vaginal side is closed by bringing raw surface to raw surface. (Fig. 90.) For this latter silk-worm gut is preferable. Occasionally one line of sutures introduced from the vaginal side will suffice to bring the everted raw surfaces together. In this operation the inverted edges of the vesical wall form a ridge on the interior of the bladder, which offers additional protection against leakage. In more extensive fistula the bladder-wall is separated from that of the vagina to such an extent as will allow of its being drawn over the gap, where it may be united to the bladder-wall on the opposite side or to the denuded vaginal mucosa.

Flap-inversion.—This ingenious method, devised by Ferguson, of Chicago, consists in making a circumferential incision around the fistulous opening down to, but not including, the vesical wall, and turning the button thus formed into the bladder. The incision is carried around the fistulous orifice at a distance of from one-eighth to one-fourth of an inch from its edges, and the detached ring is swung into the bladder, the vesical wall acting as a hinge. (Fig. 91.) The raw edges of the periphery of the button thus become inverted, and are brought face to face. In this position they are united by a fine, continuous catgut suture. (Fig. 92.) The vaginal opening is closed by interrupted silk-worm gut sutures. This method has many advantages over the classic one, and vies with the flap-splitting operation in efficiency and ease of execution. In it there is no sacrifice of tissue, it provides a broad surface of contact, and its projection above the floor of the bladder diminishes the danger of leakage. Also there

is usually less hemorrhage than in either of the other operations; and, in case the ureter opens into the fistula, it is turned into the bladder with little risk of injury or constriction.

Transplantation.—This is effected by utilizing tissues from contiguous structures for filling in the fistulous gap. The simplest of these is that adopted by Martin, of Berlin, wherein, by making a circumferential incision through the vaginal wall at a proper dis-

Fig. 92.—Vesico-vaginal Fistula. (Ferguson's Operation. Second Step.)

tance from the edge of the fistula, the dissection was carried inward to within a fraction of an inch of the fistulous opening. The flap thus formed was turned over so as to cover in the fistula, and its raw surfaces united by suture along the median line. The mucous surface of the vagina thus forms the floor of the bladder at the site of the fistula, and the raw surfaces are turned toward the vagina. When possible, this raw vaginal surface may be covered by approximation of the edges of the area from which the flap had been dissected. A

tongue of tissue may be dissected from the posterior wall of the vagina and united to the margins of the fistula, and after firm union the flap may be entirely severed. Occasionally it will be found convenient to utilize the body of the uterus or the anterior or posterior lip of the cervix to fill in the gap by freshening the surfaces and attaching to the edges of the fistula. When the posterior lip is used for this purpose, the mouth of the womb will be turned into the bladder, into which will be discharged the menstrual blood and uterine secretions. This is not only an annoyance slightly less than that for which the operation was performed, but is apt to be followed by serious bladder complications. It also places a bar on conception. With the improved methods of recent years such procedures are now seldom necessary or justifiable.

Colpocleisis.—This consists in complete closure of the vaginal canal. It was originally devised for large, inoperable fistula or such fistula as were not amenable to the methods then in vogue. It consists in denuding the vaginal wall throughout its circumference and uniting by suture. The vagina may be closed at or near the outlet or higher

Fig. 93.—Female Catheter.

up in the canal. The high operation should always be chosen where it will serve the purpose. As a result of this operation, the bladder and vagina are thrown into one cavity and their secretions intermingled. The menstrual fluid is apt to excite cystitis and upward traveling inflammation of the urinary tract, while, on the other hand, the pent-up urine is liable to give rise to inflammation of the uterus and Fallopian tubes, or even to peritonitis. When the occlusion is formed at or near the vaginal outlet, coitus is made impossible. For the reasons cited above the operation is seldom necessary or expedient, and is little practiced in this country.

After-treatment.—After the sutures are introduced and before they are tied, the bladder should be irrigated to dislodge any clots that may have accumulated during the operation. After the sutures are tied it is a good plan to partially fill the bladder with a normal salt solution to determine the presence or absence of leakage. This fluid should be immediately withdrawn. A loose gauze pack in the vagina gives comfort to the patient, and affords gentle support to the bladder. This gauze should be replaced when it becomes soiled.

The patient should be kept in bed for at least one week, during which time the bladder should not be allowed to become distended. For simple, easily approximated fistulæ, the patient may be allowed to void her urine without the aid of the catheter, but in the more complicated, and in all doubtful cases, it should be drawn off every three or four hours during the first four days, and at longer intervals thereafter. Many operators prefer a self-retaining catheter, whereby the urine is carried off as rapidly as it is formed. These, if used at all, should be watched closely, lest they become occluded by a blood-clot, and dangerous distension of the bladder ensue. They should be removed morning and evening for cleansing, and left out for an hour to give the patient a rest. The self-retaining catheter may usually be dispensed with after the fourth day. The bowels should be moved after the second day and kept soluble thereafter. The silk-worm gut sutures may remain from ten to fifteen days.

Vesico-uterine Fistula and Vesico-utero-vaginal Fistula.—These fistulæ may usually be closed by freeing the bladder-wall from the

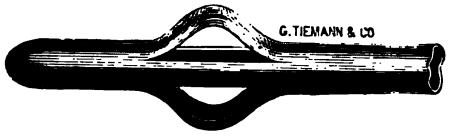


Fig. 94.—Rubber Self-retaining Catheter.

cervix, freshening the edges of the fistula, and uniting by suture. Over this, when practicable, the vaginal or cervical tissues are approximated. The buried sutures should be of catgut. Occasionally, when the bladder-wall is very thin, it may be reinforced by a shaving from the cervix. Some of the fistulæ of this class are more easily remedied by splitting the cervix through and beyond the fistula, and, after freshening the edges, uniting the cervical flaps, as in the Emmet operation.

Ureteral Fistula.—The treatment of ureteral fistula usually calls for a high order of surgical skill, and should not be lightly undertaken by the inexperienced. They may be operated *per vaginam* or through abdominal incision. When practicable, the vaginal route should be selected by preference, as being less dangerous primarily, and in case of failure less fraught with evil consequence.

Vaginal Operations.—For a fistula in the *lateral wall of the ureter* the tissues in the immediate vicinity of the fistula and surrounding it are denuded, as in the classic operation for vesico-vaginal

fistula, and brought together with interrupted sutures of fine silk or catgut. When the fistula is in the *vaginal vault* and the surrounding tissues are sufficiently lax for the purpose, a permanent artificial vesico-vaginal fistula should first be made as near to the ureteral fistula as possible, and, after this has healed at its margins, then, by denuding an area which shall surround and include both fistulous orifices, bring the raw surfaces together in such a way as to leave an open channel between the ureter and bladder. The artificial vesico-vaginal fistula, owing to its tendency to contract, should be at least half an inch in diameter, and the vesical and vaginal mucous membrane accurately approximated over its edges to prevent closure of the opening.

When the fistula is situated at the *base of the bladder,* the ureter should be dissected up for a distance of from one-half to one inch and an opening made in the base of the bladder, into which the ureter is turned and the wound closed around it. A few of the stitches are made to penetrate the outer coats of the ureter, to hold it in place, and care should be taken to secure nice coaptation of the incision without constricting the ureter.

Abdominal Uretero-cystostomy.—When the vaginal operation is not feasible the abdomen may be opened and the ureter dissected up and turned into the bladder. Where the end of the ureter is inaccessible owing to inflammatory exudation or other cause, the tube may be picked up at a higher level, traced downward as far as possible, and, if of sufficient length, cut off and turned into the bladder. A forceps thrust through the urethra into the bladder and out through the artificial opening at the fundus may be made to seize the end of the ureter and draw it into the bladder, where it is secured. The bladder may be made to approximate the ureter by tenacula hooked into its walls, or by threads passed through the same on either side of the artificial opening. If there be undue traction at the point of union, the bladder may be stitched to the broad ligament in such a manner as to relieve tension. Where the ureter is not of sufficient length to meet the bladder, the latter may be made to meet the deficiency to the extent of an inch or more by freeing it anteriorly from the pelvic wall.

The operation of *colpocleisis* associated with a large artificially prepared *vesico-vaginal fistula,* as recommended by some, is seldom justifiable. The *removal of a kidney* for the abolition of a ureteral fistula should never be resorted to except as a *dernier ressort,* or when the kidney or ureter is hopelessly diseased.

Urethral Fistula.—This form of fistula is comparatively infrequent. It usually occurs at or near the urethro-vesical junction, and is much more frequently the result of laceration than sloughing. The laceration is apt to extend widely on either side, making a formidable tear at the neck of the bladder. The bladder wound tends to heal spontaneously, but the urethral fistula becomes permanent. When the fistula is lower down the urethra, there may be no incontinence and oftentimes little inconvenience. When the laceration extends transversely and implicates one-half or more of the urethral circumference, the distal margin of the tear collapses, and, becoming adherent, produces an occlusion of the urethra just below the fistulous orifice.

Treatment.—Denudation of the edges of the fistula, beveled at the expense of the vaginal side, and perfect coaptation with closely applied fine silk-worm gut sutures, will usually result in cure. A self-retaining catheter should be left in the bladder for five days, and in eight or ten days the stitches may be removed.

Fecal Fistulæ.—These are abnormal openings into the large or small bowel, and in this connection are confined to such as communicate with the vagina or bladder. These are made evident by the escape of fecal matter into the vagina or voiding of the same from the bladder. The liquid feces of the small bowel escape uninterruptedly, but lower down in the large bowel from the sigmoid to the anus the formed fecal matter may give no special inconvenience unless the fistulous opening be of large size. Even here, however, when the bowels are loose, fecal matter will escape through the minutest opening.

Another very distressing symptom which is connected with fecal fistula is the involuntary escape of the intestinal gases through the fistula, which oftentimes rush out with an audible hissing or bubbling sound. This, with the atmosphere of foul odor which the patient carries about with her, forces her into seclusion.

Recto-vaginal Fistulæ.—These are the most frequent. The fistula may be located at any point of the recto-vaginal septum, from the cervix to the vulva. Those situated in the upper part of the vagina are most frequently the result of cancerous infiltration of the vaginal wall and subsequent breaking down of the same. Cancer of the cervix is usually the starting-point for such infiltrations. The fistula of the lower part of the septum may be due to laceration or sloughing, but in many instances is the result of imperfect union after laceration of the perineum involving the septum.

Preliminary Treatment.—For several days prior to the operation the bowels should be thoroughly and systematically purged, and the patient's diet restricted to animal broths. Milk should be interdicted, from its tendency to form curdy masses. The vagina should be cleansed and kept clean by repeated douches. A few hours prior to the operation the rectum should be washed out, and, if at the time of operation the contents of the intestinal canal show a disposition

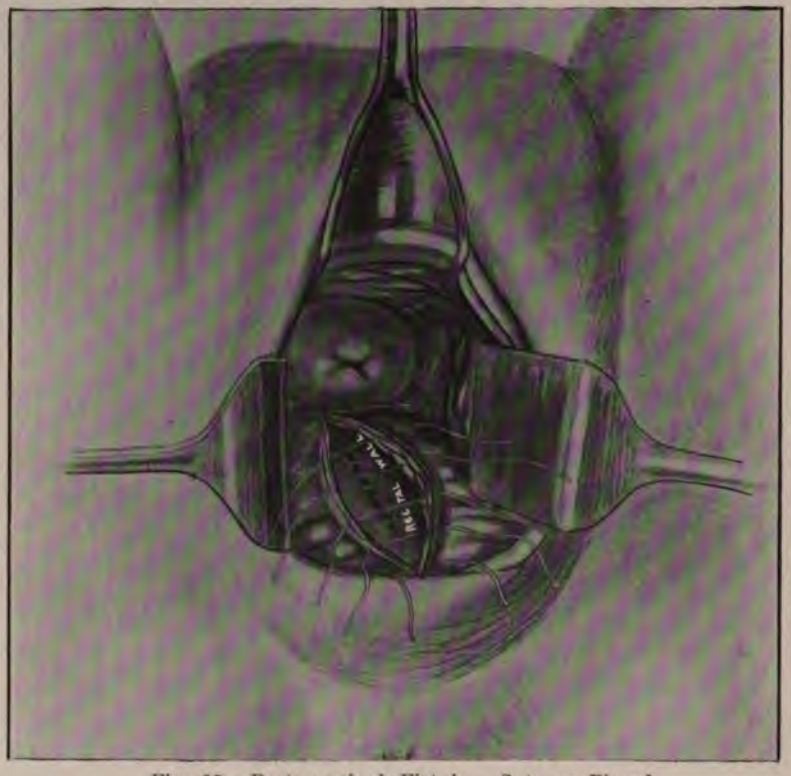


Fig. 95.—Recto-vaginal Fistula. Sutures Placed.

to escape, a tampon of gauze should be placed in the rectum above the field of operation. The rectum should be thoroughly dilated and strictures of the canal overcome before attempting to close the fistula.

Treatment.—For the cancerous fistula at the upper part of the vagina the treatment is purely palliative, and consists in keeping the parts clean by the use of plain and antiseptic douches. Very small fistulæ in the lower part of the canal may not infrequently be induced

to heal by some stimulating application or cautery, such as the cantharidal solution, nitrate of silver, or one of the mineral acids. Other fistulæ are treated on the same principles as apply to the urinary group. This includes denudation from the vaginal side, with deep and superficial sutures (Fig. 95), flap-splitting of the septum, and separate sutures for the rectal and vaginal sides, and the flap-inversion of Ferguson.

In recto-vaginal fistula situated near the sphincter, or where it is inclosed below by a bridge of cicatricial tissue, and in case of extensive tear of the septum, it is better to cut through the sphincter and treat the case as one of neglected perineal laceration. When this is not done, the sphincter should be paralyzed by forcible dilatation, and the perineum incised down to the sphincter, when the fistulous tract may be thoroughly exposed, excised, or curetted and sutured.

When the small intestine opens into the bladder it will be necessary to open the abdomen, seek for the fistula, separate the adhesions, and close the openings in the bowel and bladder separately. This oftentimes involves painstaking and perilous work, owing to the extensive and firm adhesions of the intestine. These adhesions should be separated with great care and with as little injury to the bowel as possible. Where it becomes a question of injury to bowel or bladder, the bowel should be protected at the expense of the bladder. The peritoneal cavity should be carefully guarded from contamination by gauze packing. Lesions of the bowel, including the fistula, should be repaired first. Extensive injury may demand resection or the use of the Murphy button. The fistulous opening in the bladder is freshened and neatly sutured, and usually heals promptly.

After-treatment.—The after-treatment is essentially the same as that for urinary fistula, or in case of abdominal operation that applicable to such conditions. The bowels should be opened on the third day and kept soluble thereafter. Salines, when well borne, are the best for this purpose.

CHAPTER XV.

DISPLACEMENTS OF THE UTERUS: ASCENT AND DESCENT.

NORMAL POSITION OF THE UTERUS AND HOW MAINTAINED.

THERE is no absolute and fixed position of the uterus which may be denominated normal. The uterus is a movable body, and under physiologic conditions is continually shifting its position. Its posi-

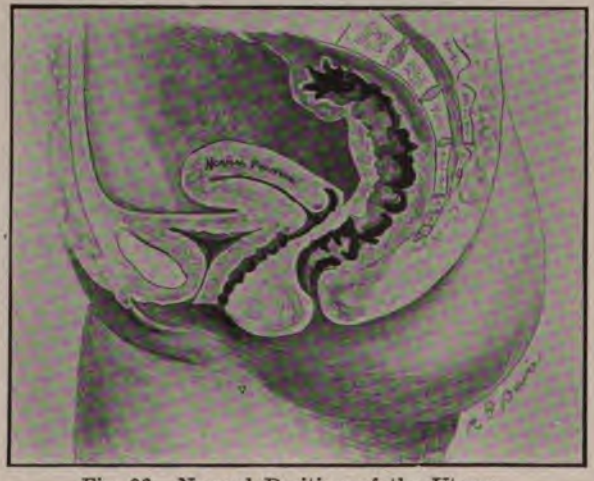


Fig. 96.—Normal Position of the Uterus.

tion in the pelvis depends upon many extraneous influences. It rises and falls with the respiratory movements; it changes its position to accommodate itself to the changed positions of the body, and in a marked degree it is influenced by the emptiness or distension of the bladder. Generally speaking, it occupies a position at or slightly above the brim of the pelvis, its body resting upon the bladder and its cervix pointing to the last sacral vertebra. Its long axis is at right angles to the long axis of the vagina. (Fig. 96.) When the bladder is distended it is pushed upward and backward, sometimes

almost to the vertical line. An impacted rectum will push the cervix forward, and thus alter its relations. Within physiologic limits the uterus may occupy any position in the pelvis, from the vertical to the horizontal with its fundus looking forward.

A fixed uterus, whatever its position, is abnormal. The mobile uterus is essential to the functional integrity of all the pelvic viscera. The position of the uterus under normal conditions is due to the ligaments, the intra-abdominal pressure, the so-called retentive power of the abdomen, and the integrity of the pelvic floor. The ligaments of the uterus are eight in number: Two utero-vesical, two utero-sacral, two round, and two broad. The round ligaments are muscular; all the others consist of reflections of the peritoneum, containing connective tissue with a variable amount of unstriped muscle-

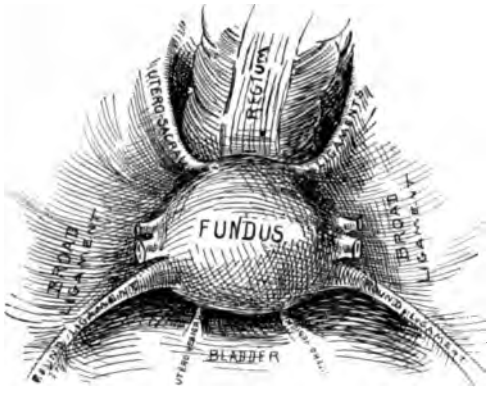


Fig. 97.—Uterine Ligaments, Showing them All on Same Plane.

fiber. These ligaments, when the uterus lies forward on the empty bladder, occupy about the same plane. (Fig. 97.) As their insertions are not on a higher level than their attachments to the uterus, they are not suspensory under normal conditions. They simply act as guys. The uterus can be elevated or depressed to the extent of an inch or more with very little opposition from these ligaments. Beyond this point the ligaments offer noticeable resistance to the upward and downward movements of the uterus.

The integrity of the pelvic floor is very essential to the proper maintenance of the uterus in its normal position. It offers a firm, resistant foundation for the pelvic organs: gives support to the rectum and bladder; and maintains the vaginal canal as a valvular,

closed passage at right angles to the uterus, thus placing them in the most favorable position for normal equipoise. The loss of integrity of the pelvic floor is by far the most potent factor in the causation of downward displacement of the uterus, and is a contributory cause of the backward displacements.

The want of support for the rectum and bladder results in the gradual formation of rectocele and cystocele, with consequent prolapse of the vagina. This, in turn, dragging upon the cervical attachments of the uterus, throws it backward and draws it into line with the canal. The uterus, being retroverted, is forced downward and backward by the intra-abdominal pressure, the ligaments yield and stretch, and the retentive power of the abdomen is wholly inadequate to offer successful resistance to the combined forces operating against it.

INTRA-ABDOMINAL PRESSURE.

This is a factor for good or evil, according to the position of the uterus. Where the fundus is directed forward so that the intestines rest upon the posterior aspect of the uterus, the intra-abdominal pressure serves to maintain it in a state of anteversion, which is normal, and to prevent retroversion, which is abnormal. It also counteracts the ascent of the uterus, and, by holding it forward out of line of the vaginal canal, prevents its descent. If, however, the uterus is in a state of retroversion so that the intestines fall upon the fundus and anterior aspect of the same, the intra-abdominal pressure serves to aggravate the condition by forcing it still farther backward and downward along the vaginal canal.

RETENTIVE, OR SUCTION, POWER OF THE ABDOMEN.

This is due to the counteracting influence of the atmospheric pressure from the outside, which opposes the descent of the pelvic organs through the natural pelvic outlet. A very familiar illustration of this physical fact is found in tapping a barrel which is filled with liquid. Daily experience teaches us that if only one opening is made in the barrel the contents will not flow. This is because of the atmospheric pressure from without. If now an air-hole be made above the level of the fluid so as to admit air into the chamber, this counterbalances the atmospheric pressure at the opening or exit, and the contents escape by their own weight. If one end of a glass tube be placed in a vessel of water, and the other in the mouth and the

air exhausted, the atmospheric pressure causes the water to rise in the tube and fill the mouth. This is in common parlance known as suction, though a little reflection will show it to be the result of atmospheric pressure exerted upon the surface of the water in the vessel. The retentive power of the abdomen is a constant and important factor in preventing the prolapse of the pelvic and abdominal organs, though not so effective as it might be were the abdominal walls rigid and unyielding to ward off the lateral pressure.

The uterus may be displaced upward, downward, forward, backward, and laterally to either side. These are known, respectively, as ascent, descent, or prolapse, anteversion, retroversion, and lateral displacement. For convenience of description the flexions will be included in this category, the most common forms of which are anteflexion and retroflexion.

ASCENT OF THE UTERUS.

This may occur as the result of the enlargement of the uterus so that it cannot be accommodated in the pelvic cavity, as in uterine fibroid; by pelvic growth so situated as to push or drag the uterus out of the pelvis, and more especially by the intraligamentous growths, effusions, and exudations, which carry the uterus along with the distended ligament. In this way ovarian, fibroid, and malignant tumors, extra-uterine pregnancy, hematoma, and pelvic exudation may be responsible for the upward displacement of the uterus.

DESCENT, OR PROLAPSE, OF THE UTERUS.

In this the uterus is depressed below its normal level. There are varying degrees of prolapse from that in which the organ occupies a position in the pelvis slightly below the normal level to that in which it hangs between the thighs, having escaped from the pelvic cavity. For purposes of description, three degrees are recognized: that in which the organ has descended into the vagina to an appreciable degree; that in which it presents at the vulvar cleft (Fig. 98); and that in which it, having escaped entirely from the pelvis, hangs between the thighs. This latter is denominated complete prolapse, or procidentia.

Prolapse of the uterus may occur suddenly or as the result of the long-continued operation of one or several of the causes which will be enumerated hereafter. Sudden, or acute, prolapse of the

uterus is very rare, the vast majority of cases being of gradual development.

Causes.—Acute prolapse is, almost without exception, the result of violence. Among the most common causes are great muscular effort, such as lifting and straining; falls from a height; blows or crushing. The ordinary form of prolapse, or that of gradual development, is largely confined to women who have borne children and

Fig. 98.—Prolapsus Uteri.

thereby have suffered material damage of the pelvic floor, as well as other changes incident to pregnancy and parturition.

In these cases laceration of the pelvic floor removes the support from below, and, as a result, distension of the rectum and bladder with efforts at evacuation lead to rectocele and cystocele. The consequent dragging on the vagina makes traction on the cervix and causes it to descend. This brings the uterus into retroposition, and in line with the vaginal canal, along which it descends. Retroversion is, in fact, a necessary forerunner to prolapse. By some it is denominated the first stage. The uterus being retroverted, the intra-abdom-

inal pressure falls on the fundus and anterior surface of the same, forcing it downward. In many instances the laceration of the pelvic floor, and other lesions incident to the parturient act, have retarded the involutionary process, leaving the uterus large and heavy and the ligaments lax.

Thus, it will be seen that in most instances a prolapse of the uterus is due to many factors, each of which is dependent on the other. Occasionally, though rarely, a prolapse may occur in the nulliparous woman or even in the virgin. In such case it will usually be found that a pelvic deformity exists, the sacrum being too straight and the vagina and uterus approximately in line. This, coupled with an absence of muscular development, offers conditions favorable to descent. In old people the absorption of fat, the loss of muscular tone, and the laxity of the ligaments act as contributory causes.

Symptoms and Course.—Acute prolapse of the uterus is usually attended with other pelvic lesions, oftentimes of a most serious character, in which the supports and ligamentous attachments of the uterus are torn and riven. The effect is usually attended with internal hemorrhage, profound shock, and agonizing pain. The patient is unable to void the urine, and there is a sensation as of something foreign in the pelvis, which leads to violent efforts at expulsion. In the ordinary form of prolapse symptoms may be slight or even wanting. Some patients complain of pelvic pain, weight, and dragging, and inability to walk or stand. There are also symptoms referable to the rectum and bladder. It is a noticeable fact that the degree of discomfort experienced by the patient bears no relation to the degree of prolapse, as many patients with the womb hanging between the thighs complain less than others with a very moderate prolapse. The rectocele and cystocele, which are usually associated with the prolapse of the uterus, have a symptomatology of their own, which has already been considered.

When the uterus passes the vulva, it is covered by the vaginal walls and forms a tumorous mass, pear shaped, with the large end downward. Within the vaginal envelope are to be found not only the uterus, but, in most instances, the protruding portions of the bladder and rectum,—the cystocele and rectocele,—along with the tubes, ovaries, and intestines. Occasionally, the anterior vaginal wall will be stripped from the bladder, thus leaving this viscus *in situ*. The os uteri occupies the most depending portion of the protruding mass. As the result of exposure, the cervix and vaginal covering of the procident uterus become dry and corneous, resembling skin. Ab-

extremity of the cervix through which the uterus has descended. A polypus may be recognized by the absence of a cervical canal, and the fact that a sound may be introduced into the uterine cavity alongside of its pedicle. In infravaginal elongation of the cervix the sound will demonstrate the unusual length of the canal and that the fundus is well up in the pelvis. Bimanual and rectal examination will also reveal the body of the uterus at or near its normal level.

Treatment.—The treatment may be palliative or radical. With the improved methods of modern times and the slight risk attending them, the radical treatment has grown rapidly in favor and is much practiced. There is, however, a very considerable contingent of such subjects that cannot bring themselves to consent to operative interference, and for whom other measures must be devised.

The first and second degrees of prolapse, especially if the pelvic floor is not too much damaged, may sometimes be satisfactorily treated by restoring the womb to its normal position and holding it there by a Hodge pessary or some of its modifications. When this fails, a

Fig. 99.—Inflatable Ring Pessary.

ring pessary will occasionally do good service. The inflatable ring pessary is a good device. In the majority of cases neither of these will be found effective, owing to the break in the pelvic floor, the straightness of the canal, and the weight of the uterus backed by the intra-abdominal pressure. In some cases a cup and stem pessary supported by straps under the perineum attached to a belt around the waist will be found efficient, but is liable to give rise to irritation and ulceration if the patient be too much on her feet. The Braun colpeurynter is, taken all in all, probably the most rational and effective mechanical support of the prolapsed uterus associated with a broken pelvic floor. Hollow glass or rubber balls of proper size, and adjusted with the patient on her back, are cleanly and effective, and in some respects preferable. Whatever form of mechanical appliance is used, it should, if possible, be removed at night and thoroughly cleansed before reinsertion. The vagina should also be douched by some mild antiseptic.

manner. The patient should be kept recumbent for at least three weeks. By the time the sutures are absorbed, firm union has taken place and the fixation complete. It must be admitted, however, that even this will fail under extraordinary conditions, and no auxiliary means should be neglected to support and sustain the uterus.

CHAPTER XVI.

DISPLACEMENTS OF THE UTERUS: VERSIONS AND FLEXIONS.

VERSIONS AND FLEXIONS OF THE UTERUS.

VERSIONS and flexions of the uterus are denominated according to the position of the fundus. When the fundus inclines forward, the condition is known as anteversion or anteflexion; when backward, retroversion or retroflexion. By version is meant a rotation of the uterus on its transverse axis; by flexion, a bending of the uterus on its long axis. The uterus may be bent forward, constituting anteflexion; backward, constituting retroflexion; or to one or the other side, constituting lateroflexion. The uterus may be turned forward, constituting anteversion; backward, constituting retroversion; or to one or the other side, constituting lateroversion. As the normal position of the uterus is with the fundus forward, its anterior wall resting on the bladder, and there is no symptomatology pertaining to any degree of forward tilting of the uterus, it is doubtful if there be such a thing as pathologic anteversion. The symptoms heretofore ascribed to the strongly anteverted uterus are due to an inflammatory condition of the organ, underweight, abnormal fixation through adhesions, or to some other lesion. Anteversion will, therefore, not be considered as a distinct pathologic entity.

ANTEFLEXION.

Anteflexion is a forward bending of the uterus. A moderate degree of anteflexion of the uterus is normal. It is more pronounced in the virgin than in the matron. Under ordinary conditions the anteflexion is not fixed, and may be overcome by slight counter-pressure. When the uterus is removed from the body and laid down it becomes straight. There are two distinct forms of anteflexion: 1. That in which the body is bent upon the cervix. 2. That in which the cervix is bent upon the body.

Flexion of the Body on the Cervix.—In the first form the cervix retains its natural relations to the axis of the vagina,—that is, at right angles to it,—but, owing to the shortening of the utero-sacral ligaments, is drawn upward and backward and held there. It is con-

sequently higher in the pelvis than normal, and comparatively immovable. This throws the fundus forward. The uterus in these cases is usually about normal in size, but may be undeveloped or even infantile. The flexion is at the level of the internal os. The anterior wall of the uterus at the point of flexion is increased and thickened. The muscular wall at this point is, to a degree, replaced by fibrous tissue. The posterior wall, where it bends over the flexion, is thinned. The cervix is short, and, as a rule, the canal patulous and cylindrical. The endometrium, in cases of long standing, is changed: usually atrophied and wanting in lymphoid elements, though at times hypertrophied. It may be inflamed.

Fig. 101.—Anteflexion: Flexion of the Body on the Cervix, Utero-sacral Ligaments Shortened.

Causes.—The primal cause is found in the shortening of the utero-sacral ligaments. Whether this shortening is due to some inflammatory condition of the ligaments or to a developmental change is not determined. In early life the uterus occupies a higher position in the pelvis than in the adult. An arrest of development on the part of the utero-sacral ligaments, or any disease by which their elasticity is diminished, will throw the developing body forward. (Fig. 101.) Intra-abdominal pressure, lacing, engorgement at the menstrual period, or growths in the body of the uterus will increase the flexion.

Symptoms.—The cardinal symptoms are dysmenorrhea and sterility, to which may be added dyspareunia and various localized nervous

derangements. The menstrual flow is regular, but scant. It is ushered in by pain over the region of the womb, which is paroxysmal. The pains resemble those of labor, and result in the expulsion of the imprisoned blood, which is more or less clotted, and is followed by a period of relief. The regular menstrual flow is followed by a leucorrhea which lasts for several days. The menstrual effort has a depressing and weakening influence on the patient. The longer the trouble continues unchecked, the greater is the severity of the pain and the effect on the general health. In the married, sterility, vaginismus, and dyspareunia are common. Cervical complications, such as inflammation and erosion, are not common.

Fig. 102.—Anteflexion: Flexion of the Cervix on the Body.

Flexion of the Cervix on the Body.—In this form the cervix is in line with the vaginal canal. It is bent more or less sharply on the body, which occupies its normal position or may be tilted more or less backward: anteflexion with retroversion. (Fig. 102.) The cervix is hypertrophied, sometimes markedly so, and usually conical. The uterus lies low in the pelvis. The depth of the uterine canal is increased, due to the elongated cervix. The attachment of the bladder to the cervix is abnormally high. The endometrium is hypertrophied and much thickened at the point of flexion. The overgrowth of the cervix is a developmental freak which cannot be explained.

Symptoms.—The principal symptoms are sterility, various nervous reflexes, and more or less dysmenorrhea. The patient suffers

from backache, and a bearing down, with dragging sensations, about the pelvis. Vaginismus is not uncommon. The menstrual flow is more abundant than in the preceding form, and is less clotted and less painful. The succeeding leucorrhea is also more profuse.

The essential cause of the dysmenorrhea and sterility dependent on anteflexion has long been a subject of controversy. On the one hand, obstruction at the point of the flexure has been advanced as the sole factor, and, on the other, structural changes in the endometrium. The exponents of the obstruction theory contend that the narrowing of the canal at the flexure offers a mechanical obstacle to the exit of the menstrual fluid, and to the entrance of the spermatozoa, which fully and simply explains all the attendant phenomena. The opponents of this view claim that a canal that will admit a uterine sound cannot offer any serious obstacle to the menstrual blood, much less to the spermatozoa, which are only one six-thousandth of an inch in diameter. The truth probably lies on both sides. While a sound may be pushed up through the canal, it must be remembered that even with the greatest gentleness it exerts a mechanical force far greater than a few drops of blood behind the obstruction, and that it gains entrance by pushing aside the tissues. The propulsive power of the spermatozoa is infinitesimal. It is often necessary to straighten the canal by traction of the cervix before even the sound can be introduced. It should also be remembered that there is a distinct thickening of the mucosa at the point of flexure, and that all conditions are aggravated at and near the menstrual period. The mucosa is engorged and swollen, the flexure augmented by the increased heaviness of the body, while the normal expansion of the canal which accompanies the menstrual effort is more than counterbalanced by these changes.

But this does not account for the great pain, the nervous disturbance, the vaginismus, the dyspareunia, the clotting of the menstrual blood, nor yet for the constancy of sterility. These are undoubtedly due to structural changes in the uterus, and especially the endometrium, whereby its functions are perverted and its sensitiveness increased. There is an attendant localized supersensitiveness of the genital tract and the parts dominated by the same system of nerves. The endometrium is not normal; consequently it affords no suitable soil for the ovule, and is probably inimical to the sperm-cell. It is attenuated and devoid of succulence, and is wanting in lymphoid elements. The epithelium clings tenaciously, and, instead of melting away as it should, is forced off in flakes and shreds. The blood

coming too rapidly from sundered vessels and not being intimately blended with the lymphoid elements, coagulates. And this increases the difficulty.

To summarize, the chief factors of disturbance are:—

1. Mechanical obstruction.
2. The increase of the same at the menstrual period.
3. Supersensitiveness of the genital tract.
4. Altered endometrium, which is inimical to the elements of fecundation and increases the difficulties of menstruation by the tenacity of the epithelium and the clotting of the menstrual blood.

Diagnosis.—Bimanual examination will reveal the relation between the cervix and body. The fingers in the vagina will recognize a distinct angle at the point of flexion. To exclude a fibroid in the anterior wall of the uterus, the thickness of the body and the relation of the posterior wall to the cervix should be ascertained by deep palpation, either through the abdominal wall or the rectum, while the anterior wall is steadied by the vaginal finger. In difficult cases the direction of the canal may be ascertained by the sound.

Treatment.—For the first form of anteflexion—that of the body on the cervix—the object is to straighten the canal, overcome the obstruction, and produce an alterative effect on the endometrium. As the utero-sacral ligaments are, in large measure, responsible for the abnormal position of the uterus, a seemingly rational course would be to deal with them direct, as one would relieve the tension of a contracted muscle by tenotomy. This, however, has not received the sanction of usage.

The canal may be straightened, temporarily at least, by dilatation. This should be by the branched dilators, and should be thorough, systematic, and deliberate. The canal should be dilated to the extent of an inch or an inch and a half, as indicated by the scale of the dilator, and from ten to fifteen minutes should be consumed in the process, after which the dilator should be held in position for an equal length of time. In the meantime steady traction should be exerted on the cervix, and the womb drawn down in the pelvis to stretch and lengthen the utero-sacral ligaments. After the dilatation the womb should be thoroughly curetted, irrigated, dried, and swabbed with 95-per-cent. carbolic acid. This should be followed by a gauze packing, which may be allowed to remain from four to six days in the absence of pain or fever. The patient should remain recumbent for at least a week. In married women, pregnancy will sometimes follow this renovation, which if it go to full term insures a perma-

nent cure. In the unmarried the procedure may have to be repeated at longer or shorter intervals.

Dysmenorrhea associated with anteflexion is frequently relieved by the glass stem pessary. The instrument, as devised by Dr. Hepperlen, is made of solid glass, terminating in a flange sloping downward. The flange has two small holes through which sutures are introduced to retain the pessary *in situ*. The pessary should be introduced as soon after menstruation as is possible, and removed in from three to four months. The presence of diseased appendages and adhesions interdict its use. Before insertion the patient is anesthetized and the uterus dilated and curetted under thorough asepsis. The stem is held in place by silk-worm gut, the sutures being introduced deeply into the tissues of the anterior and posterior lips of the cervix. The patient is kept in bed from three to six days, then allowed to resume her duties.

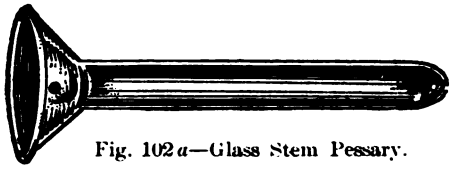


Fig. 102*a*—Glass Stem Pessary.

In the second form of anteflexion, where the cervix is bent on the uterus, the accompanying hypertrophy of the cervix will require attention. Here the uterus lies low in the pelvis, with a disposition to drop, and consequently little traction should be exerted on it. Moderate degrees of hypertrophy of the cervix will yield to the alterative changes produced by the dilatation and curettage. The steps of the operation are as described above. Where the cervix is inordinately elongated it should be amputated. This may be done at the same sitting with the dilatation and curettage. In all other respects the treatment is the same as in the first form.

RETRODISPLACEMENTS OF THE UTERUS.

These consist of retroversion and retroflexion. Retroversion and retroflexion are so frequently associated and have so much in common as to justify joint consideration. The retrodisplaced uterus usually occupies a lower level in the pelvis. This is because of the fact that the long axis of the uterus is brought in line with the vagina through which it descends. Retrodisplacement of the uterus may occur at any age. In general terms, it may be said that retroflexion is essentially a lesion of the child-bearing woman as anteflexion is of the nonparous. Retroversion of the uterus, for convenience of

abdominal walls are flabby, thus, in great measure, abolishing the retentive power of the abdomen. In a more gradual, but none the less effective, way the broken pelvic floor acts as a potent factor in retroposition.

The bulging forward of the posterior vaginal wall in rectocele drags the cervix forward and downward and tilts the uterus backward until the intra-abdominal pressure is exerted on its anterior surface, when the sequel is as described above. Inflammatory bands strung between the uterus or its appendages, and the structures in the hollow of the sacrum by shrinkage may overturn and bend that organ into a state of retroposition. An overdistended bladder, or the dorsal decubitus aided by tight bandaging during the puerperium may impart the initial movement. Where the cervix moves forward in the arc of a circle as the fundus moves backward, the result is retroversion. When, however, as is usually the case, the cervix fails to respond to the movements of the fundus, the uterus becomes bent upon itself, constituting retroflexion. Usually the two are associated, in which we have retroversion combined with retroflexion. Prolapse of the tubes and ovaries usually accompany the backward displacement of the uterus.

The effect of retrodisplacement on the organ itself is damaging. This arises principally from two causes: *i.e.*, interference with the circulation and imperfect drainage. The broad ligaments being twisted, the venous circulation is embarrassed. Passive congestion, especially affecting the endometrium, ensues, which, in turn, is liable to pass over into inflammation. The imperfect drainage of the uterus invites microbic infection. Hence endometritis, often purulent, is a common accompaniment of this form of displacement.

Symptoms.—One of the most prominent and constant symptoms of retroposition of the uterus is backache. This is referred to the lumbar and sacral regions. Not infrequently the pain radiates down the thighs, and is accompanied by a weakness of the limbs, which renders walking or standing irksome or even impossible. Headache is also common, which is referred to the top of the head, or occipital region. A burning pain at the nape of the neck complicates some cases. Constipation is the rule. This is largely mechanical, and is due to the pressure of the fundus on the rectum. For the same reason piles are frequent. Dragging on the bladder through traction on the vesico-uterine ligaments produces vesical irritation, and not infrequently inability to control the urine. This is often taken for and treated as cystitis. Displacement of the ovaries often gives rise to

ovarian pain. The endometritis and circulatory embarrassment give rise to leucorrhea, which is often profuse. Menstruation is usually profuse, and is seldom accompanied by pain, owing to the fact that the subjects are generally women who have borne children. In such the uterine canal is usually patulous and the endometrium fully developed or hypertrophic. Reflex disturbances are, however, usually aggravated at this period.

Diagnosis.—Bimanual examination reveals the absence of the fundus in its normal position, and the finger in the vagina discovers it in the hollow of the sacrum. In the lesser degrees of retrodisplacement the fundus may not be felt either by the external or internal hand, yet the cervix and the lower segment of the uterus may be traced by the vaginal finger in the direction of the fundus. The rectal touch will give valuable aid in all cases of retroversion, and in case of doubt should never be neglected. This, conjoined with traction on the cervix, will often enable the examiner to outline the uterus with great precision. When evidence, or even a suspicion, exists of inflammatory exudation in the vicinity of the uterus or appendages, traction on the cervix should not be resorted to. Finally, the sound will show the position of the uterus by following the direction of its canal. This, also, should be used sparingly and with discretion.

Treatment.—The treatment is mechanical and operative. Mechanical treatment consists in restoring the uterus to its normal position and holding it there by some mechanical device. Manual replacement is the method of choice, because safer, and should always take precedence when practicable. It is not always expedient, nor yet feasible, to replace the organ at once. The uterus may be inflamed, swollen, and excessively tender. The appendages may be in like condition, or adhesions may exist which must be overcome before the organ can be restored.

Inflammation should be combated by rest, by keeping the bowels soluble, by hot douches, and hip-baths. Excellent results are sometimes obtained by swathing the hips in several thicknesses of flannel which have been dipped in very hot water and passed through a wringer. Over this should be placed dry flannel to retain the heat and moisture. This should be removed in an hour, and the patient rubbed dry under cover. Gradual elevation of the womb by vaginal tampons saturated with boroglycerid relieves the circulation and diminishes congestion. When the inflammation has been subjugated and the tenderness abated, measures for the restoration of the uterus may be instituted.

When adhesions exist, if of recent date and not firm, they may be broken up in the rectum by the Schulze method, which consists in carrying the fingers up in the rectum and hooking them in between the uterus and rectum, making pressure first in one direction and then another until all adhesions are overcome and the uterus liberated. Should the appendages be adherent, they may be dealt with in like manner. Too much force should not be exercised in the maneuver, and it should not be undertaken when a purulent accumulation exists or is suspected in the pelvis, lest rupture of the same should precipitate septic peritonitis. The patient should be etherized and the cervix steadied by the thumb in the vagina during the operation. In ex-

Fig. 104.—Congenital Retroflexion of the Uterus.

treme degrees of retrodisplacement the uterus is sometimes caught between the utero-sacral ligaments and gives the impression of being adherent. It is most easily disengaged by pressure from the rectal side. Etherization may be necessary to relax the ligaments.

Congenital Retroflexion. — Retroflexion may be congenital or acquired. The congenital form is very rare. The position of the uterus in this form is characteristic. It is not much, if any, depressed, but is located far back in the pelvis near the posterior wall. The organ is sharply bent on itself, so that the fundus and cervix lie almost parallel with each other. The fundus occupies the *cul-de-sac*, and presses against the rectum. (Fig. 104.) The flexion is at the internal os, and the posterior wall is much thickened. The anterior

wall is thinned. Not infrequently the uterus is fixed by inflammatory adhesions. The ovaries and tubes are seldom displaced. Endometritis, often purulent in character, is a common accompaniment.

Symptoms.—The most prominent symptoms are backache, headache, dysmenorrhea, sterility, and obstipation. The backache is continuous, and is associated with weight and bearing down. The headache is referred to the occipital region, and is more violent at the menstrual period. The dysmenorrhea is similar to that of anteflexion, and is characterized by a scant flow and clotting of the blood. Pressure of the retroflexed womb on the rectum interposes a mechanical obstacle to the expulsion of its contents, as also to the venous circulation, giving rise to hemorrhoids.

Diagnosis.—Bimanual examination by rectum and vagina will reveal the position of the uterus and the approximation of the fundus and cervix. Usually the angle produced by the flexion can also be determined.

Treatment.—Such cases are seldom or never amenable to mechanical or operative measures designed to restore the uterus to its normal position. About all that can be done is to cure the endometritis and provide for drainage. This is effected by an incision through the projecting spur on the posterior wall, whereby the canal is made patulous and to an extent shortened and straightened. The knife should be carried from above the internal os downward, and should penetrate deeply. The canal is now dilated, curettage performed, and the cavity swabbed with carbolic acid and packed with gauze. The package should be snug, and reinforced by vaginal tamponade to control the hemorrhage, which is apt to be profuse. The packing should be allowed to remain forty-eight hours. The vagina should be cleansed and loosely packed every second day for three weeks; and it will materially add to the success of the operation if a fillet of gauze be laid along the tract of the incision at like intervals during the first six or eight days.

LATERAL DISPLACEMENT OF THE UTERUS.

This may occur to the right or left, and is usually due to the contraction of the broad ligament or to adhesions. The uterus may be pushed to one side by an inflammatory exudation or a morbid growth. The treatment is seldom required for this condition *per se*.

CHAPTER XVII.

REPLACEMENT AND RETENTION OF THE UTERUS—KELLOGG'S OPERATION.

REPLACING THE UTERUS.

WHERE no contra-indication exists to the replacing of the uterus, it may be done by one of two methods. That is, by manipulation or by the aid of instruments. The patient should be prepared for the

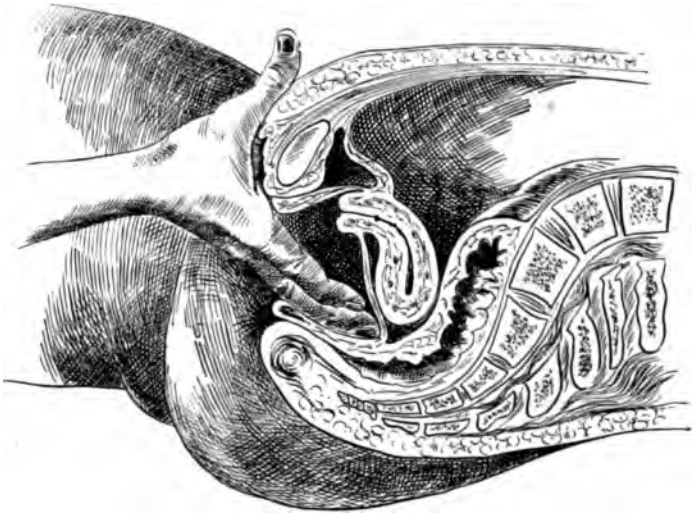


Fig. 105.—Bimanual Reposition of the Retroverted Uterus. (First Movement.)

occasion by emptying the bladder and rectum and by loosening the clothing. *It is absolutely essential that there should be no constriction about the waist.*

Manual Replacement of the Uterus.—This may be effected by placing the patient on her back, in the Sims or knee-chest position. The patient being on her back with the legs flexed, two fingers of one hand are introduced into the vagina and the other hand laid on the abdomen. (Fig. 105.) The uterus is first drawn away from the sacrum by pressure on the posterior lip of the cervix toward

the bladder. Then one finger is disengaged and makes pressure on the fundus, while the other finger maintains the pressure on the cervix. The fingers of the external hand depress the abdominal wall and are forced downward and backward toward the sacral curve. (Fig. 106.) As the fundus rises it is caught on the tips of these fingers and the vaginal finger shifts to the front of the cervix, which is pushed backward and upward. (Fig. 107.) Finally, as the uterus is brought into a state of anteversion, the cervix is again pushed forward, sliding the uterus forward in the pelvis to its normal position. If the fundus be lifted directly forward it may be

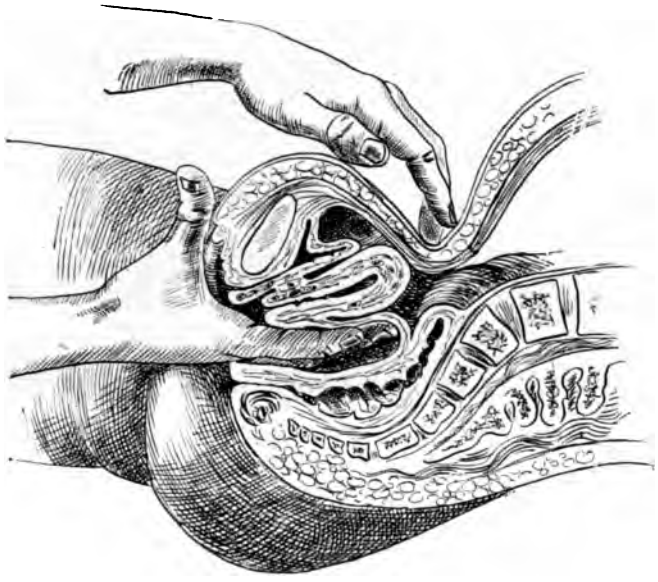


Fig. 106.—Bimanual Reposition of Retroverted Uterus. (Second Movement.)

caught and held by the promontory of the sacrum. This can be avoided by swinging it around this projection to the right or left, whichever is most easy of accomplishment. Another method quite as efficacious consists in placing the patient in the Sims position, and hooking two fingers over the cervix and drawing it backward. One finger—the second—is now disengaged, and presses upward on the fundus while the index finger pulls backward on the cervix. In this way the womb is made to revolve on its axis and is thrown into anteversion. In this, as in the dorsal position, the fundus should be swung around the promontory of the sacrum, usually toward the left.

Instrumental Replacement.—It is seldom that the foregoing method will not be successful, and, therefore, the necessity for resorting to instrumental means of replacement is very infrequent. The instruments usually utilized for this purpose are the uterine sound and the uterine repositor. Both of these are objectionable, because they must be introduced into the uterine cavity, which they are liable to mutilate and infect, and because it is impossible to estimate the force that is being exerted, or the effect of that force, on the delicate

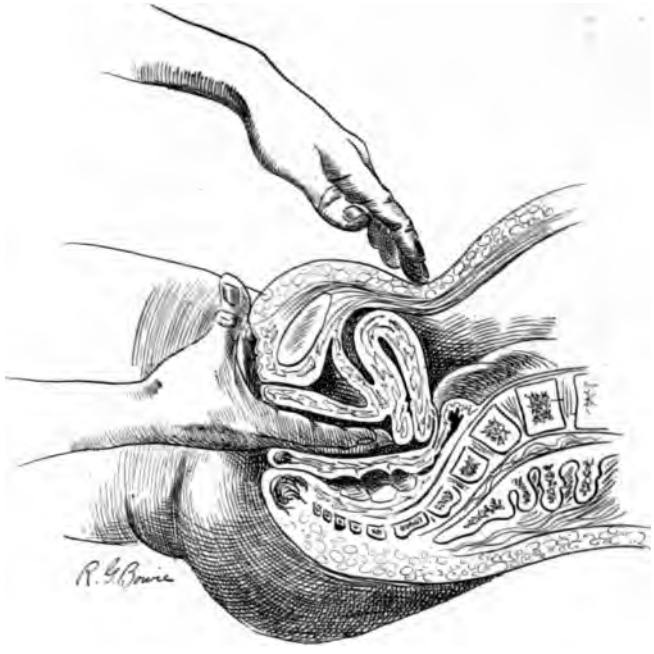


Fig. 107.—Bimanual Reposition of Retroverted Uterus. (Last Movement.)

structures which are subjected to it. Nevertheless, conditions will arise in which we are compelled to resort to them if we would relieve our patient, and it is a consoling fact that under the usual aseptic precautions the instances are few in which serious damage has resulted from their use.

Replacement by the Sound.—The sound, bent to conform to the shape of the canal, is carried to the fundus with its concavity toward the sacrum. It is now rotated so as to bring the concavity forward.

In this maneuver the external end of the sound is made to describe the arc of a large circle, to prevent injury to the mucosa. Now, by gentle leverage on the sound, aided by a finger on the fundus through the vagina or rectum, the uterus is raised and brought forward until it can be grasped by the abdominal hand and forced into position. (Fig. 108.)

Replacement by the Uterine Repositor.—The uterine repositor consists of a movable lever on the end of a handle, controlled by a screw at the external end of the handle. This lever can be made to describe the arc of a half-circle. It is adjusted so as to be easily introduced into the uterine canal, when by turning the screw it lifts the organ and throws the fundus forward. It is a powerful instrument, and should be used with the utmost discretion, and always,

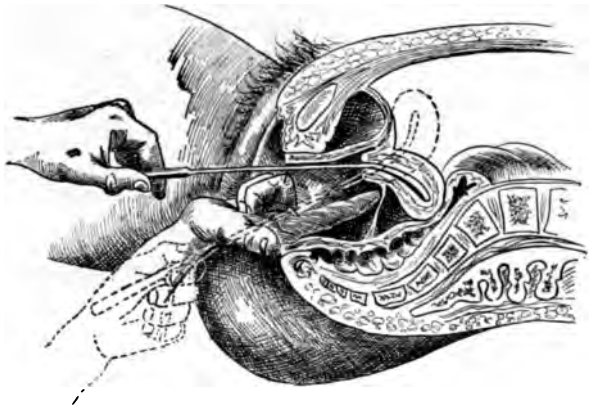


Fig. 108.—Reposition of Retroverted Uterus by the Sound.

when possible, be controlled and assisted by a finger in the rectum or vagina.

RETENTION OF THE UTERUS AFTER REPLACEMENT.

Unless retained in place by artificial means, the uterus will usually revert to the abnormal position from which it was just rescued. The methods by which the uterus is kept in place are mechanical and operative.

Mechanical Methods.—These include the tampon and pessary. The tampon is efficient and may be made to serve every purpose, but it requires such unremitting attention on the part of the physician as to preclude its general adoption. As a precursor to the use of the pessary where the latter would not be tolerated, as in inflammatory

conditions of the uterus and adnexa, or when a temporary effect is desired, as in acute displacement, the tampon is indicated. In such, a wad of cotton is placed in the posterior fornix back of the cervix, and a full-sized vaginal tampon placed under the cervix to maintain it in position. The value and necessity of the post-cervical tampon will be explained farther on. These tampons should be removed, and, after cleansing the vagina, replaced at regular intervals: usually every twenty-four hours, or oftener when the discharges are abundant or foul.

THE PESSARY.—The vaginal pessary is an agent for good or for evil, according as it is used judiciously or otherwise. The intelligent gynecologist of to-day finds infrequent use for the pessary, and yet it has a place in gynecic practice that cannot be ignored. The object of the pessary and the manner of its adjustment are very imperfectly understood by the mass of the profession, and hence the evil accruing

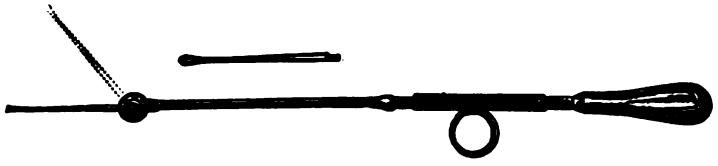


Fig. 109.—Sims's Uterine Repositor for Replacement of the Retroverted Uterus.

from its use has probably overbalanced the benefits. It has been said that it requires a high order of mechanical skill, and an intimate knowledge of the pelvic mechanism, to adjust a pessary. This, in a large measure, is true, for it is impossible to adjust a pessary too nicely, and there are infinite shades of variation in the pelvis and its contents which can only be met by mechanical instinct. Nevertheless, much good, though imperfect, work can be accomplished by any man of ordinary intelligence and mechanical ability who will acquaint himself with the cardinal facts.

In the first place it must be learned that the pessary is made for the woman, and not the woman for the pessary. Almost any kind of a pessary can be jambed into a woman's pelvis, and oftentimes with the result of holding the uterus upward and forward. But this may be at the expense of grave and sometimes irreparable injury to the delicate structures upon which it impinges. Inflammation, ulceration, and even perforation of the vaginal vault, the bladder, or

the rectum have been penalties for such rash and ill-judged practice. On the other hand, too small a pessary dropped into the vagina will be promptly expelled, or, if tolerated, will be wholly inadequate as a means of support. It must be remembered that the object of the pessary is to sustain the uterus in its normal position without fixing it, and that it must not exercise undue pressure at any point. The uterus must be allowed perfect freedom of motion throughout the range of its normal mobility, and must be sustained at a level which will not interfere with its circulation. In other words, it must be allowed free play to accommodate itself to the varying positions of the body, and to rise and fall with the bladder. Hence, it must be suspended as upon a movable fulcrum, and not wedged.

This opportunity is offered by the attachment of the vagina to the posterior wall of the cervix. Here exists a pouch which passes upward and forward back of the cervix, and offers a convenient nook

Fig. 110.—Smith-Hodge Pessary.

for the reception and retention of the pessary. The effect of upward pressure at the vault of the *cul-de-sac* when the fundus is inclined forward is to elevate the cervix and tilt the fundus downward and forward. In other words, it throws the uterus into anteversion. This is the only place where a mechanical support can be applied through the vagina to produce a suspensory effect on the uterus, and it is so well adapted to this end that one is almost tempted to the belief that it was designed for the purpose. Nevertheless, it required the ingenuity of a Hodge to discover and utilize it for the support of the retrodisplaced and prolapsed uterus. The Hodge pessary, and modifications of the same, are so constructed that one end fits into the pouch back of the cervix, and the other is in proximity to, but does not rest upon, the pubic rami. This gives to the instrument as viewed from the side the outlines of a letter "S" with the most exaggerated curve at the top, or uterine end. The pessary, as usually marketed, is constructed of hard rubber and is molded in one piece,

as if from a ring, of the thickness of heavy telegraph wire. The original Hodge pessary is almost rectangular, as viewed from the front; but there are modifications of this, the principal of which are those of Smith and Thomas. The Smith pessary is narrower and tapers toward the pubic extremity. The Thomas pessary has an enlarged and thickened cross-bar at the uterine extremity.

The pessary properly adjusted should not exercise pressure at any point. It should be so poised that when the uterus is in anteversion the pessary barely touches the vault of the post-cervical pouch, while the instrument, as a whole, occupies the axis of the vagina.

Owing to its shape, if the uterus is tilted backward, pressure on the upper segment of the pessary will cause the lower end to move forward until it impinges on the pubic rami, which prevents the farther backward displacement of the uterus, and it soon returns to its normal position, when the pessary drops back into the vaginal

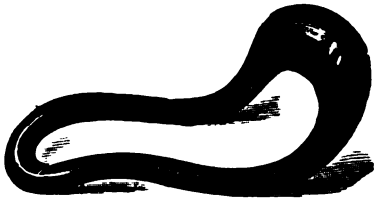


Fig. 111.—Thomas-Smith Pessary.

axis. It is because of this movement, by which pressure on one end will throw up the other, that the pessary has received its name: lever pessary. Under ordinary conditions it requires but the slightest resistance on the part of the pessary to meet the backward movement of the uterus, when, responding to the conservative forces instituted by Nature for the purpose, it soon returns to its normal position. Thus, in the properly adjusted pessary there is neither severe nor sustained pressure at any point.

In selecting a pessary for any case, the depth of the canal should be taken with the uterus in place, the patient recumbent. A finger should be introduced to the top of the posterior vaginal fornix, and the distance between this and the symphysis pubis ascertained. Deducting a finger's breadth from this will give the proper length of the pessary. The width of the pessary should be approximately that of the vaginal canal, to prevent lateral rotation. It should never be wedged into the vagina. The curves of the pessary should conform

to those of the vagina when the uterus is in place. A deep post-cervical pouch will demand a longer and sharper curve at the uterine end than a shallow one. If the pessary press upon the neck of the bladder or urethra, as made evident by vesical irritation or dysuria, the pubic curve should be altered to correct the trouble. The hard rubber pessary may be molded to suit any case by heating it over a spirit-lamp, by which it is rendered soft and pliable. After cooling, which may be done quickly by plunging it into cold water, it will retain the shape imposed upon it.

Introduction of the Pessary.—The pessary should never be introduced until the uterus is in position, and not then if there be contra-indications in the way of inflammation of the uterus or adnexa. Great sensitiveness at the vault of the vagina is a contra-indication, whatever be the cause. In introducing the pessary it should first be

Fig. 112.—Hodge Pessary, Showing Varying Degrees of Curvature.

lubricated and seized by the lower extremity, the uterine curve looking upward. The labia are separated by the fingers of the other hand and the pessary introduced and pushed up into the vagina until it is arrested by the cervix. A finger is passed back of it into the vagina and hooked over the upper cross-bar, which is depressed until it clears the cervix and enters the post-cervical pouch. (Fig. 113.) Now, by withdrawing the finger and rocking the pessary backward and forward it will settle into place. After careful inspection to see that it is properly adjusted and adapted to the case, the woman is directed to get on her feet. If all is right she should not be conscious of its presence.

She should be directed to return to the office in four or five days, or sooner if she experiences any inconvenience, and at longer intervals thereafter until satisfied that all is well. She should also be

instructed to use the vaginal douche as often as need be to insure cleanliness. This may mean a daily or weekly douche, according to the character and the amount of the secretions. Removal of the pessary at stated intervals and reinsertion after one or a few days gives rest to the tissues and opportunity to observe the effects.

The Schultze sled pessary may sometimes be substituted for the lever pessary, and is especially adapted to cases in which a deep post-cervical pouch exists. Its lower extremity has for its point of contact the anterior surface of the cervix. It has the advantage of not interfering with the sexual relations, but is not so effective in sustaining the uterus as the lever pessary. The number of pessaries that has been devised for the correction of the displacements of the uterus

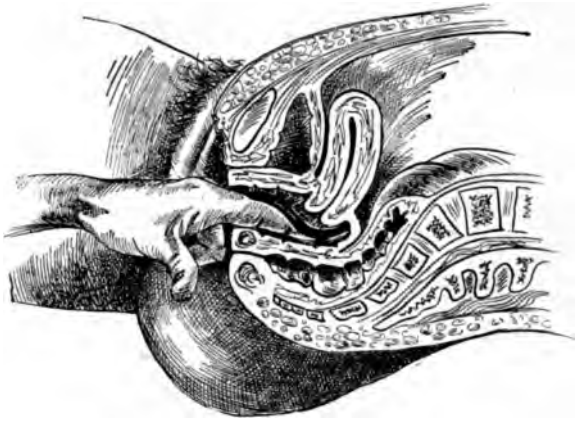


Fig. 113.—Adjusting the Pessary.

is too great even for enumeration. Time was when every gynecologist of note and many general practitioners felt it incumbent upon themselves to devise a pessary. Most of these were worthless or worse than worthless. For practical purposes those that have been described are sufficient to meet the requirements of any case to which a pessary is applicable.

Operative Treatment. — As in the case of pessaries, in times agone, so at a later period when operative measures, to a large extent, supplanted the mechanical, the ingenuity of man has been taxed to the utmost to devise some operative procedure by which the malposition of the uterus may be corrected and the organ retained at or near the normal level. Here, also, we have such an avalanche of technique as to preclude anything like consideration of all. I shall,

is directly over the inguinal canal. It should be about one inch in length. It is very necessary for the success of the operation that the field should be kept bloodless; therefore the first incision should be superficial, merely passing through the skin and superficial fat. A vein crosses near the upper angle of the incision, and a small artery near the lower angle. To avoid these they should be kept out of harm's way by a couple of blunt hooks, which are inserted at the middle of the wound and drawn in opposite directions toward the

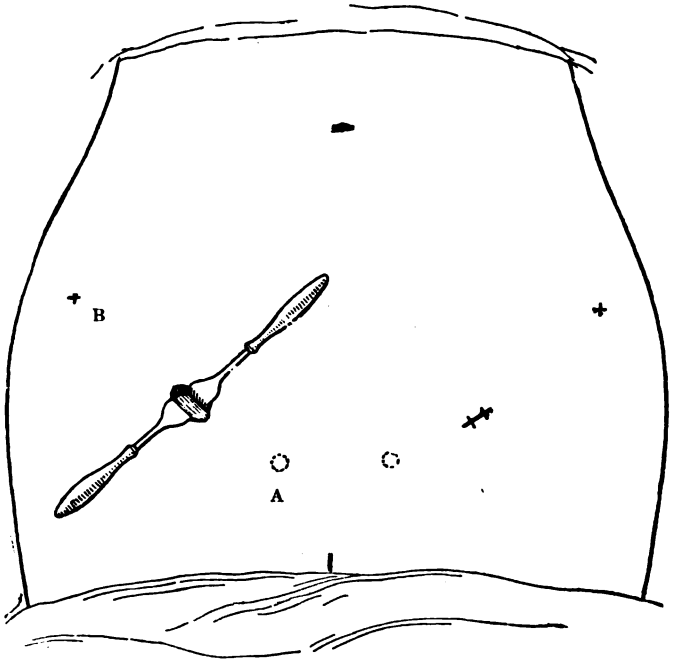


Fig. 115.—Kellogg's Operation for External Shortening of the Round Ligaments. (Incision.)

upper and lower angles. The assistant now inserts a pair of retractors, with which lateral traction is made, exposing the field and at the same time keeping the vessels out of the way. A few slight touches of the knife, followed by the blunt hooks and retractors as before, expose the glistening aponeurosis of the external oblique. By moving the retractors in various directions the external ring and Poupart's ligament are brought into view, which form the landmarks of the canal. The former is recognized by the diverging longitudinal

fibers and the arcuated cross-fibers, and the latter as a dense, white opaque line, which forms the outer boundary of the canal.

2. Securing the Ligament.—A small puncture is now made with the point of the scalpel about a line internal to Poupart's ligament and near the upper angle of the incision. One of the blunt hooks is now introduced (not too deeply) and the point turned toward the median line. The tissues engaged are drawn up for inspection. In many instances the ligament will be brought into view. When such is not the case it is usually included in the mass taken up by the hook, and should be sought for by manipulating the two hooks in such a way as to separate and drop successively strand after strand of the included tissues until the ligament appears. If the first attempt

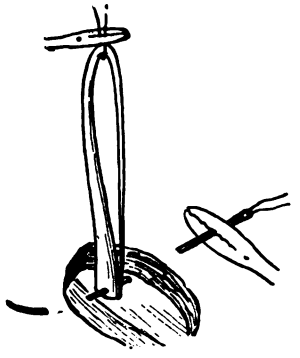


Fig. 116.—Kellogg's Operation for External Shortening of the Round Ligaments. Anchorage of the Ligament. (First Step.)

fails, the hook may be re-entered again and again, first in one direction and then in another until the ligament is found. It usually lies quite superficially along the outer edge of the canal, nestling close to Poupart's ligament. When the ligament has been separated to an extent to be easily handled, it is seized by the thumb and finger, and, while traction is made on the proximal side of the loop, the tissues which cling to it are detached. The ligament is drawn out as far as it will go without undue effort, the peritoneum being stripped back by the aid of the forceps. In this way from four to six inches of the ligament are isolated, the upper extremity of which is quite thick, heavy, and strong. The ease with which it can be drawn out differs materially in different cases. It sometimes "runs" with the

facility of a cord over a pulley; at others, offers considerable resistance. Crushing or bruising of the ligament or infection will almost inevitably be followed by suppuration, and, therefore, it must not be caught up in forceps, ligated, or handled too much. Rubber cots should be worn on the fingers.

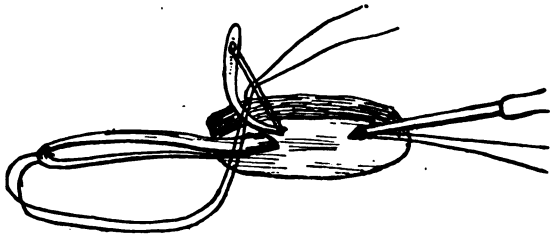


Fig. 117.—Kellogg's Operation for External Shortening of the Round Ligaments. Anchorage of the Ligament. (Second Step.)

3. Anchorage of the Ligament.—The ligament being drawn out and held up, a silk thread is passed through its loop two inches from its point of emergence on the proximal side. This is secured by clamp forceps placed near the ligament. While the ligament is held taut by ligature, a silk-worm gut suture is passed from the skin surface on

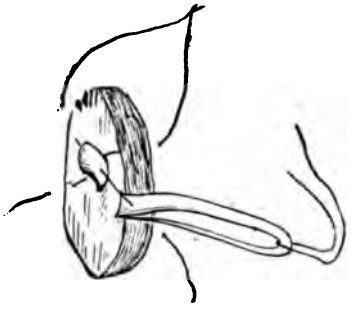


Fig. 118.—Kellogg's Operation for External Shortening of the Round Ligaments. Anchorage of the Ligament. (Third Step.)

one side through the base of the ligament and on to the skin surface on the other, including all the tissues on both sides that have been divided. The ends of the suture are secured by snap forceps. The aneurism needle armed with a thread is passed from without inward through the aponeurosis of the external oblique muscle, entering one

and one-half inches external to the opening through which the ligament has been drawn, and emerging within one-half of an inch of the same on the same side. Passing the thread which is attached to the loop of the ligament (the forceps having been removed) through the loop of the thread on the aneurism needle, the latter is withdrawn, bringing with it the ligament, which is thus woven into the aponeurosis. The ligament being kept taut by the silk ligature, a second silk-worm gut suture is introduced, passing from skin surface to skin surface, including all intermediate tissues and the ligament at its point of emergence and that portion of the ligament overlying the aponeurosis. The free end of the ligament is now folded back in the opposite direction and the silk-worm gut sutures tied, which completes the operation. The wound is dressed antiseptically. The sutures are removed at the end of a week.

CHAPTER XVIII.

VENTROSUSPENSION OF THE UTERUS—INVERSION OF THE UTERUS.

In the original Alexander method the ligament was sought at the external ring. As it is here often very much attenuated and occasionally broken up into strands, the finding of the ligament was often a matter of great difficulty. Many failures resulted.

Newman seeks for the ligament at the internal ring, as also does Goldspohn. The latter dilates the canal, through which he introduces a finger to break up adhesions. Edebohls opens the canal throughout its entire length. In all these methods of external short-

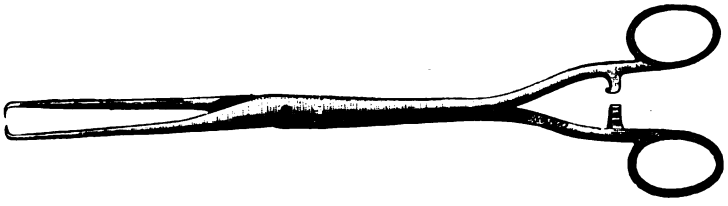


Fig. 119.—Bullet Forceps for Holding Uterus in Hysterorrhaphy. (Kelly's Operation.)

ening of the round ligament, with the possible exception of Goldspohn's, it is essential that the uterus be free and mobile. Adhesions of the uterus or appendages, or gross lesions of the same, are positive contra-indications. Rupture of pus-cavities and extravasations of pus, followed by peritonitis and death, have been the penalty for ill-judged attempts at replacing the uterus by traction on the ligaments or by external manipulation. Complications which contra-indicate the external shortening of the round ligaments are more safely met by abdominal section. One can never be certain in advance what side issues may complicate the restoration of the uterus to its normal position. Tumors may have to be removed, a bowel stitched or resected, pus-cavities evacuated, blood-vessels ligated, the uterine appendages or the vermiform appendix removed, and, indeed, a great diversity of conditions met and dealt with which could not by any

means have been successfully combated in any other way. The intra-abdominal methods of retaining the uterus in anteposition after its replacement are hysterorrhaphy and internal shortening of the round ligaments.

VENTROSUSPENSION OF THE UTERUS.

This is also known as hysterorrhaphy, and improperly as ventrofixation. In this operation the usual median section is made below the umbilicus and the complications dealt with. Then one or two fingers are introduced and the fundus brought forward. The uterus is now seized by bullet forceps in the median line posterior to the fundus, and the uterus held within easy reach. The peritoneum is

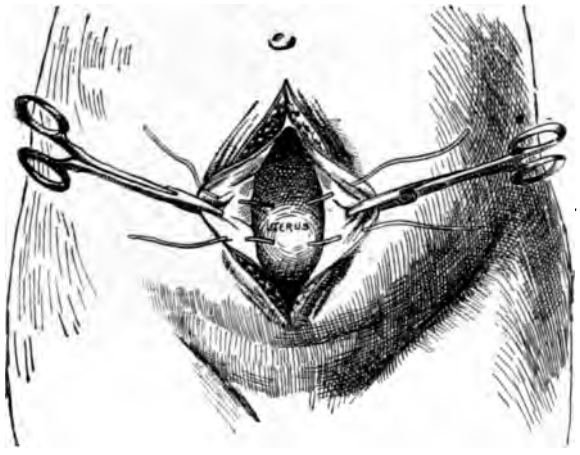


Fig. 120.—Ventrosuspension of the Uterus. (Kelly's Operation.)

seized with catch forceps near the lower angle of the incision on either side and drawn out over the edges of the wound. A curved needle, armed with fine silk or catgut is passed through the peritoneum, entering one-half of an inch from the edge and emerging one-half of an inch farther outward, thence across to the uterus, entering about one-half of an inch below the apex of the fundus on the anterior surface and including enough of the uterine tissue in breadth and depth to give a secure hold; thence to the peritoneum of the other side, through which it passes in inverse order. (Fig. 120.) The ends of the suture are secured by clamp forceps, and a second suture is placed in the same manner one-half of an inch higher, and passes through the apex of the fundus. The forceps are now removed, and the sutures drawn upon to bring the uterus in snug apposition to the

peritoneum and tied. The ends of the sutures should be clipped short and buried in the free margin of the peritoneum, which should be stitched over them as a precaution against suppuration. The abdominal wound is closed in the usual manner.

Inflammatory exudation at the suture punctures produces adhesions between the uterus and the parietal peritoneum and forms a bond of union between them. This gradually yields to traction and pressure and becomes drawn out into a band which sustains the uterus by its fundus and constitutes the so-called central ligament. This admits of free mobility of the uterus within limits corresponding to the length of the band. Hence the operation is known as a suspension, and not as a fixation. In some instances this band does not form, and the uterus remains firmly adherent to the abdominal wall, constituting a veritable fixation. In others the band becomes so elongated that it ceases to exercise any restraining influence on the uterus, and the organ sinks backward into a state of retroposition.

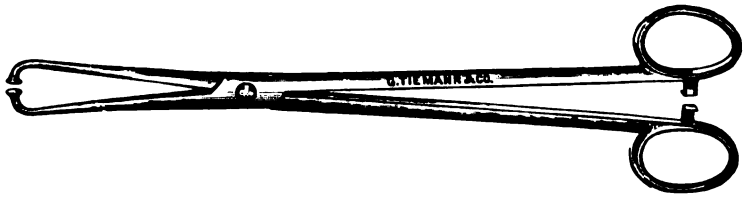


Fig. 121.—Author's Button Forceps, for picking up the Round Ligament in Round Ligament Suspension of the Uterus.

While the operation is well adapted to women who have passed the climacteric, or from whom the appendages have been removed, there are objections to its use in child-bearing women, in that it occasionally gives rise to serious embarrassment in pregnancy because of the inability of the uterus to develop symmetrically with the growing fetus. Parturition is also interfered with because of the misdirected efforts of the distorted uterus, which in some instances offers insuperable obstacles to normal labor and calls for the Cæsarean section. Nevertheless, many cases progress without serious inconvenience, especially those in which the uterus has drawn away from the abdominal wall.

Round Ligament Ventrosuspension of the Uterus.—The prime requisite for an operative device for retaining the uterus in normal poise is one that will utilize the natural supports of the organ, that will insure a certain amount of mobility, that will adapt itself to the various functions of the uterus,—pregnancy and parturition,—

that will be lasting in its results, and withal easy of execution. We know that the round ligaments grow *pari passu* with the development of the uterus in pregnancy, and that they return to their normal condition after parturition. This I have repeatedly verified by abdominal section in pregnant women. Theoretically, the same change should occur in the ligament which has been implanted in the abdominal wall. Profiting by Ferguson's suggestion, who cut the ligament and drew the proximal portion through the posterior sheath of the rectus muscle, I devised the operation which I have denomi-

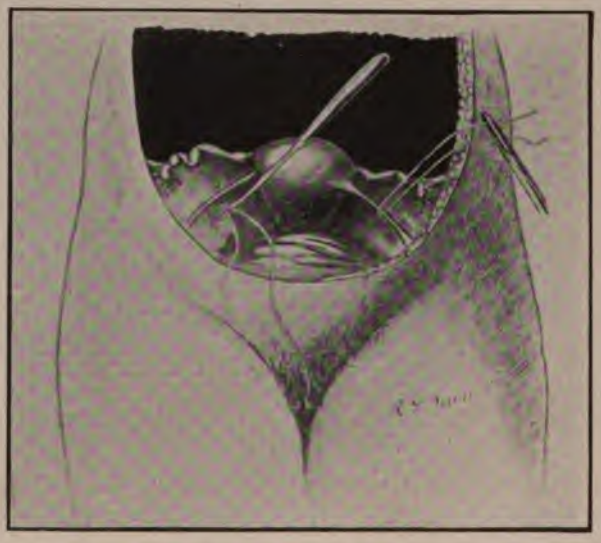


Fig. 122.—Ventrosuspension of the Uterus (Gilliam's Operation. First Step.) Passing a Thread under the Round Ligament.

nated round ligament ventrosuspension of the uterus. The steps of the operation are as follows:—

Operation.—1. An abdominal incision three or four inches in length is made in the median line at the usual site between the umbilicus and pubes.

2. The adhesions are broken up and the fundus brought forward.

3. By lifting up the broad ligament of one side on the tip of a finger applied to the posterior surface, the round ligament is brought into view and is picked up with a bullet forceps.

4. Selecting a point an inch and a half from the uterus, a thread is passed under the round ligament, and the ends of the thread are brought out of the opening and secured in the bite of a clamp forceps, which is laid on the surface of the abdomen.

5. The other ligament is sought for and secured in the same manner.

Fig. 123.—Retractor for Retracting Skin and Fat in Round Ligament Ventrosuspension of the Uterus.

6. At a point about one inch and a half above the pubes, the peritoneum, muscle, and fascia are caught up by a volsella and pinned together, being careful that the edges of these layers are in line.

7. Traction is now made, and with a claw retractor the skin and superficial fat are drawn in the opposite direction, and by a sweep of the knife the face of the fascia is laid bare.

8. With a narrow-bladed knife, or better, with a Cleveland ligature-carrier or some similar instrument, a stab wound is made from

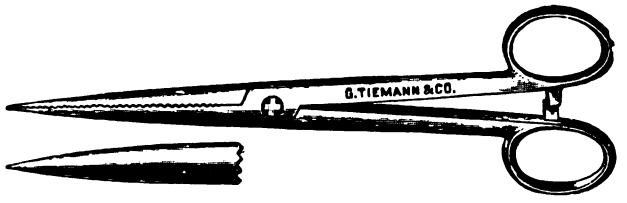


Fig. 124.—Author's Perforating Forceps, for Piercing the Walls and Securing the Thread by which the Round Ligament is Drawn into Place.

the surface of the fascia into the peritoneal cavity, one inch from the edge of the abdominal incision. If the ligature-carrier is used, the jaws are separated, and by an outward movement of the handle brought into plain view at the large opening.

The thread which loops the round ligament is now placed in the jaws, the clamp forceps removed, and the ligature-carrier withdrawn, bringing with it the thread and the ligament. If a knife has been used to make the perforation, it is withdrawn and a slender forceps

introduced, with which the thread is caught up and the ligament drawn into place.

9. Now, while the ligament is held taut, with its loop end just above the surface of the fascia, a catgut suture is passed through it, including the tissues on either side, and back again, where it is tied. This is cut close to the knot, the suspending

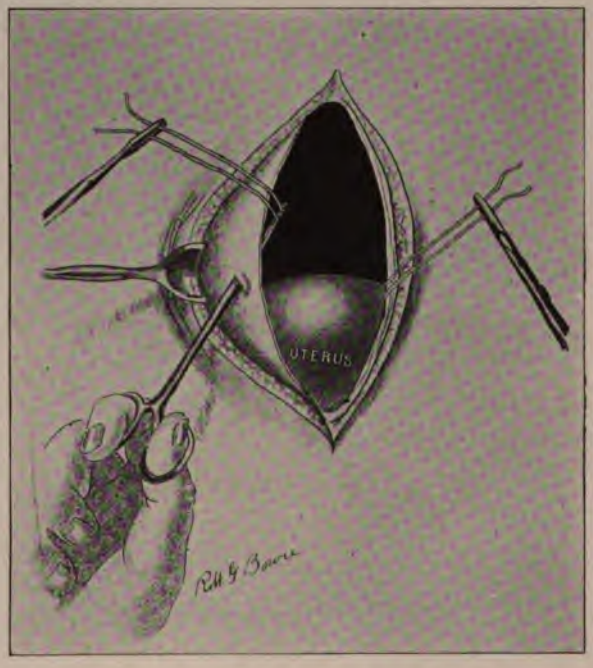


Fig. 125.—Ventrosuspension of the Uterus. (Gilliam's Operation. Second Step.) Piercing the Abdominal Wall and Grasping the Thread which Holds the Ligament.

thread cut close to the ligament and withdrawn, and the volsella and retractor removed.

10. The other side is dealt with in like manner and the abdominal incision closed.

After both ligaments have been fastened it will be observed that an opening exists between the uterus and abdominal wall of from seven to nine inches in circumference, and that the two openings on the distal side of the loop will readily admit two and sometimes three

fingers, and are soft, yielding, and distensible—conditions under which strangulation of the bowel would hardly be conceivable. It will be observed that the uterus is not suspended, but rests easily and naturally on the bladder, from which it can be raised to a position little short of the vertical. Thus the uterus is enabled to conform to the altered conditions of the bladder and rectum and to the various bodily movements. Should pregnancy ensue, the ligaments develop *pari passu* with the growth of the uterus, and there is neither embarrassment in gestation nor difficulty in parturition.

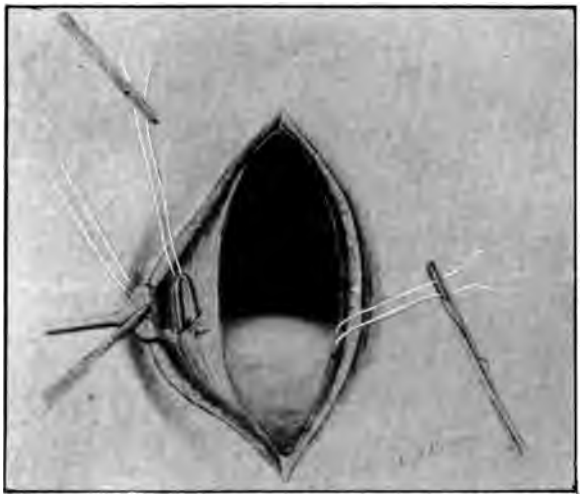


Fig. 126.—Ventrosuspension of the Uterus. (Gilliam's Operation. Third Step.) Drawing up the Ligament through the Puncture in the Abdominal Wall and Securing it by Suture.

In my first cases I was troubled with suppuration, which was often protracted and aggravating. Of late I have had no suppuration. This I ascribe to the fact that I handle the ligament as little as possible, and never touch it with my fingers after it has been drawn into place, and also to the fact that I clip the suspending thread close to the ligament, so as to avoid contamination by drawing it full length through the loop of the ligament after its exposure on the abdominal wall. Rubber cots or gloves may be used to advantage as a safeguard against infecting the ligaments.

INVERSION OF THE UTERUS.

In this the uterus is turned inside out. The inversion may be partial or complete. As usually found, all that portion of the uterus above the cervico-vaginal junction is involved, and protrudes from the external os as a polypus. The portion of the cervix which has not been inverted forms an encircling band to the upper extremity of the protruding mass, which has been aptly likened to a cuff. This cuff

Fig. 127.—Rubber Cots.

is called the cervical ring. In rare instances the entire organ is inverted, including this portion of the cervix.

Causes.—In nine cases out of ten inversion is an accident of childbirth, and usually occurs in the delivery of the placenta. Traction on the cord and irregular pressure on the fundus are the common exciting causes. It may occur from a short cord dragging the fundus down as the child is expelled. The non-puerperal uterus may be inverted from the dragging of a morbid growth and the expulsive efforts

Fig. 128.—Rubber Glove.

of the uterus to dislodge it. The pedunculated fibroid is responsible for most cases, and next in order come the malignant growths. I once did a vaginal hysterectomy in a case of inversion occasioned by a diffuse cancer of the endometrium. In some instances a partial inversion of the fundus will be converted into complete inversion by muscular action of the womb, the womb literally swallowing itself in its attempt to expel the portion which had dropped into its cavity. Polypoid growths from the fundus often produce a partial inversion at the point of attachment. The inverted portion under traction is

cord-like and indistinguishable from the pedicle, and has been cut away time and again in removing the growth, with disastrous results.

Symptoms.—The early symptoms in the puerperal form are hemorrhage and pain. The pain is variable in intensity, and is often accompanied by a dragging or pulling sensation. The hemorrhage is apt to be very profuse and is sometimes rapidly fatal. Later, if the patient survive, it becomes intermittent, and alternates with profuse leucorrheal discharge. In chronic cases these symptoms disappear, and there is little discomfort except from the presence of the mass in the vagina.

Diagnosis.—The diagnostic landmarks are the presence of a pear-shaped body in the vagina, the absence of the uterus from the pelvis,

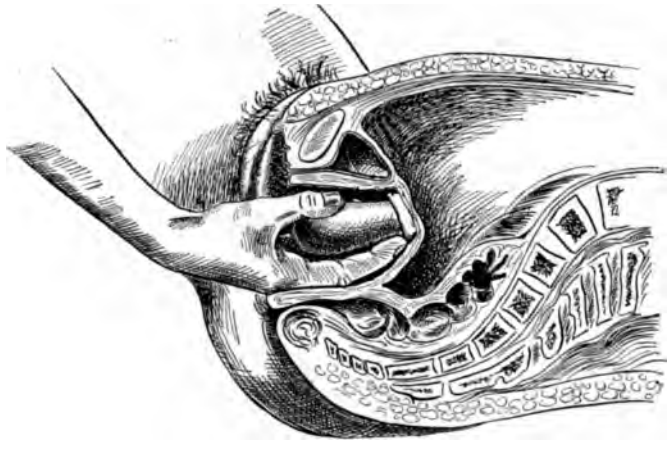


Fig. 129.—Replacing the Inverted Uterus.

the presence of a cervical ring at the upper extremity of the mass, the absence of the uterine canal communicating with the vagina, and the presence of a funnel-shaped depression on the abdominal side of the cervical ring through which the uterus has descended. Occasionally the openings of the Fallopian tubes at the lateral angles at the base of the tumor may be discerned. The inverted uterus is so similar in color and consistence to a fibroid polypus as to be distinguished from it with difficulty. When the openings of the Fallopian tubes can be made out there will remain little doubt as to its nature. The absence of the uterus from the pelvis may be determined by bimanual examination, or by one or two fingers in the rectum and a sound in the bladder. The finger in the rectum will also discover the funnel-

shaped opening on the abdominal side of the cervical ring. The rectal examination will be facilitated by traction on the vaginal mass, so as to bring its upper extremity within reach of the rectal finger. A sound introduced within the external os will penetrate but a short distance, and, by sweeping it around the neck of the protruding mass, will disclose a shallow gutter between the cervical ring and the mass.

Fig. 130.—Reducing an Inverted Uterus by Splitting the Posterior Lip of the Cervix. (First Step.)

No uterine canal will be found connecting with this gutter. Very rarely an occlusion of the uterine canal will be found in connection with a uterine polypus, but the presence of the uterus in the pelvis will serve to differentiate this from inversion. It is a safe plan, in view of the disastrous consequences of mistaking an inverted womb for a uterine polypus, to regard a doubtful case as one of inversion until otherwise proven by careful and methodical examination.

Treatment.—In the puerperal form, if taken early, replacement is not difficult. The uterus should be grasped in the hollow of the hand, the fingers closed about it, and by graduated pressure forced backward through the cervical ring. (Fig. 129.) The lower segment of the uterus should be made to pass the ring first, then the body, and finally the fundus. Counter-pressure by the hand on the abdomen will facilitate reduction. Dilatation of the cervical ring while pressure is

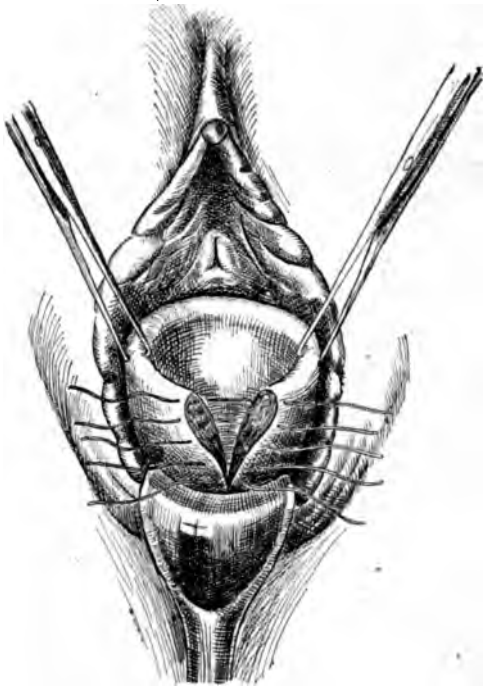


Fig. 131.—Reducing the Inverted Uterus by Splitting the Posterior Lip of the Cervix. (Second Step.)

exercised from below will often materially aid in the reduction. This may be effected by finger-pressure through the abdominal wall, or better still through the rectum. In cases of longer standing it may be necessary to exercise much tact and patience in the efforts at reduction. Long experience has demonstrated the fact that many cases will yield to judicious and persevering effort, that were formerly abandoned as hopeless. Violence and lurching movements should be avoided under all circumstances. A reduction often occurs suddenly

even after long and ineffectual efforts at taxis. This is because of the sudden relaxation of the cervical ring. The Trendelenburg position may sometimes be used to advantage. When manual efforts are unavailing, sustained elastic pressure is from the pessary of Gariel, or from the cup and stem pessary with steel or elastic bands, or spiral springs, attached to a belt around the waist, often succeeds. Gauze packing of the vagina has also proved effective. Persistent effort of the husband to consummate the act of sexual intercourse is credited with having cured an incarcerated case. Probably in this case the successful issue was not so much due to the mechanical pressure as to the relaxation of the cervix under sexual excitement.

Should taxis fail, operative measures may be called for. Splitting of the posterior lip of the cervix is probably the most effectual and least harmful of all procedures heretofore recommended. (Figs. 130 and 131.) After the organ is reduced the incisions should be sutured. Growths should be removed before the uterus is restored to its natural position. In a few cases of old standing, inflammatory adhesion of contiguous surfaces from pre-existing inflammation will withstand all efforts at reduction. As a *dernier ressort*, the offending organ may be removed by vaginal or abdominal hysterectomy.

CHAPTER XIX.

INFLAMMATION OF THE CERVIX UTERI—TROPHIC DISORDERS.

INFLAMMATION OF THE CERVICAL MUCOSA (ENDOCERVICITIS).

THE cervix—from its position—is exposed to many deleterious influences, and is consequently very often the seat of inflammatory reaction. It participates in many of the inflammatory conditions of the body of the uterus, transmits the acrid secretions from the uterine cavity, and is affected by them, and is furthermore subject to the lacerations and contusions incident to childbirth. It is also subject to injury from the vaginal side, as in coition, masturbation, the various manipulations incident to examination and treatment, and in the fitting and wearing of pessaries. It is also exposed to the influence of pathogenic germs, gonorrheal or septic, which are introduced from without or are residual in the vagina. Here, as in the body of the uterus, it is the lining membrane that is most frequently and most affected, but, by reason of the anatomic structure of the cervix, the inflammatory changes more readily extend to the deeper parts and often involve the entire cervical structure. It should be remembered that the cervix is merely a sphincter, guarding the outlet of the uterine cavity. It has no intimate connection with or influence on surrounding structures; is sparsely supplied with lymphatics, and these in their course do not traverse important or inflammable structures. Consequently the ultimate results of a cervical inflammation are in no way comparable to those of the uterus proper, in that they seldom pass beyond the confines of the cervical tissues.

A specific or septic inflammation may, however, pass upward into the uterine cavity, or even affect secondarily the vagina. The compound racemose glands of the cervix, like the vulvo-vaginal glands, are favorite resorts for the gonorrheal germ. Here it will lurk for weeks or months, showing little activity and no disposition to quit its quarters, until, awakened by some untoward event,—excessive venery, debauchery, or traumatism,—it becomes instinct with life and malignant energy. The pathogenic germ, like the Scriptural war-horse,

can snuff the battle from afar; so that injury of tissues somewhat remote may call it forth. In this way gonorrheal vaginitis sometimes becomes secondary to cervical infection.

Inflammation of the cervix may affect principally—though seldom exclusively—the glands or the interstitial substance. As a rule, the two conditions go hand in hand. Inflammation of the cervical

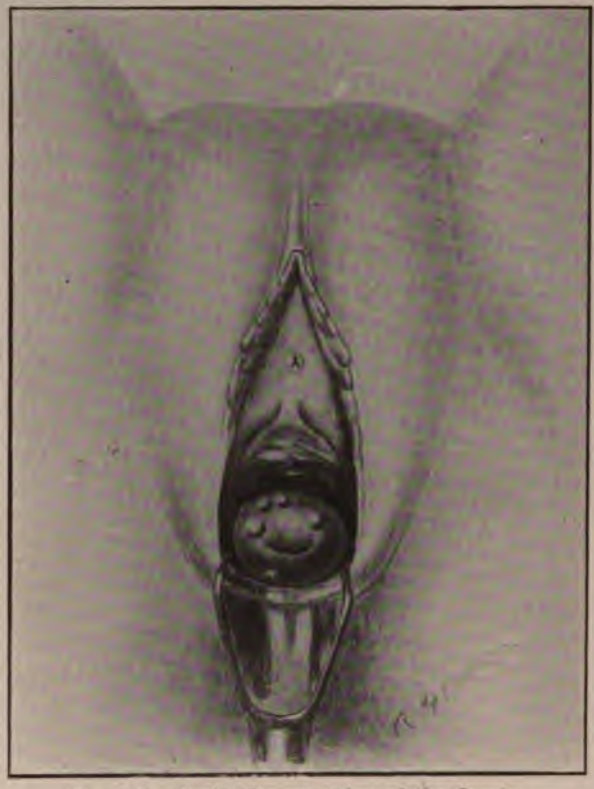


Fig. 132.—Cystic Degeneration of the Cervix.

glands (glandular cervicitis) is accompanied by excessive secretion. The secretion is thick, tenacious, and abundant, and is occasionally streaked with blood. It may become purulent or mixed with pus. Occasionally the outlet of the gland becomes sealed, when, the secretion continuing, the gland will become distended, push outward, project from the surface, grow and enlarge, and finally become pedunculated. This constitutes the glandular polypus of the cervix. Some-

times, owing to interstitial inflammation, thickening, and pressure, the gland-duct becomes obliterated. The result is an increase of the pent-up secretions and a globular enlargement, which if it be near the surface may be both seen and felt.

These glands seldom become larger than a pea, but may be so abundant as to literally crowd the cervix. If punctured, they seldom extrude their contents, owing to the absence of elasticity of the cervical structures. Under pressure the secretion can be expelled. It is usually of honey-like appearance and consistence. These little retention cysts are known as Nabothian follicles, but it should be remembered that they are nothing more nor less than occluded and distended cervical glands. The condition just described is called *cystic degeneration* of the cervix. (Fig. 132.)

Not infrequently, and especially where there is glandular involvement, where the cervix is hyperemic and bathed in abundant secretion, there is an exfoliation of the superficial epithelium, imparting a raw, red, granular aspect to the part affected. This, upon superficial inspection, resembles an ulcer, and is usually denominated such by careless or ignorant physicians. There is, however, no loss of tissue, and upon close inspection it will be found that, so far from there being an excavation, the affected area is, if anything, on a higher level than the surroundings. In some instances the columnar epithelium has been replaced by flat cells and in others overlaid by them. The epithelium is never wanting, and consequently the lesion is, in no sense, an ulcer. This condition is known as *granular erosion* of the cervix. (Fig. 133.) It is occasionally limited to a narrow margin around the external os, but may involve the greater portion of the exposed surface of the cervix. It is seen in its worst forms in connection with lacerations of the cervix.

Symptoms.—Constitutional symptoms in the form of chill, fever, and malaise are almost never present in uncomplicated cervical inflammation. In many instances, in the lighter forms, subjective local symptoms are ill defined or wanting. In the severer grades there exist a dull, heavy weight and dragging in the pelvis, oftentimes associated with a burning sensation in the vagina. The general health is usually more or less affected and the patient is nervous. Reflex nervous phenomena are especially marked in the interstitial form accompanied by cystic degeneration. Here headache is constant and the patient is apt to be nervous, emotional, and even hysterical.

The local manifestations as revealed by examination are variable. The cervix is enlarged and the secretions increased. The cervix may

be soft and tumid in the uncomplicated form; indurated and nodular, as in *cystic degeneration;* raw, red, studded with minute granules, bathed in secretion, and disposed to bleed, as in *granular erosion;* or there may be seen springing from the canal or vaginal surface of

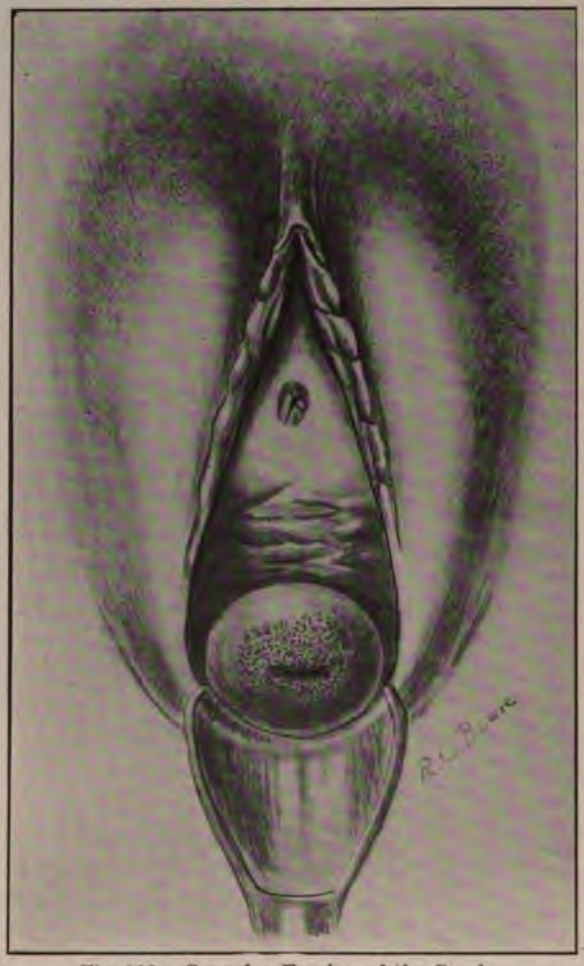


Fig. 133.—Granular Erosion of the Cervix.

the cervix small masses, sometimes pedunculated, of bright red or varying hue and of oyster-like consistence, accompanied by a profuse slimy or purulent discharge. This is *glandular cervicitis,* and the pedunculated masses are *glandular polypi.*

Treatment.—On account of the numerous crypts and deep depressions, the abundant and tenacious secretion, and the difficulty of dislodging it, the medical treatment of the cervical canal is difficult and for the most part unsatisfactory. The secretion can neither be wiped nor washed away. It may be withdrawn by suction by attaching a small piece of rubber tubing to the end of a long-nozzled syringe or it may be dislodged by small bits of sponge held in the bite of a dressing forceps. It is, however, never entirely removed, and offers a barrier to the application of medicaments to the inflamed surfaces.

Fig. 134.—Thomas's Suction Syringe for Removing Cervical Secretions.

In acute gonorrheal and septic inflammation of the cervix an attempt should be made to arrest the disease before it implicates other parts or lapses into the chronic form. For this purpose strong antiseptics should be resorted to at regular intervals, and frequently repeated hot douches of milder solutions utilized between-times. After freeing the canal of its mucous plug, a cotton wrapped applicator should be dipped into one of these preparations and carried up into the canal. The medicines should be applied to every part of the canal, and as far as possible pressed into the depressions with which the canal abounds. Care should be taken not to carry the

Fig. 135.—Emmet's Applicator.

applicator into the uterine cavity. The applications most in vogue are pure carbolic acid and Churchill's tincture of iodine. One or the other of these may be used separately, or they may be combined in equal proportions. The applications may be made at intervals of from three to seven days. The application should be followed by a tampon saturated with boroglycerid. This should be removed in twenty-four hours.

Granular erosion of the cervix is symptomatic, and almost always depends on inflammation of the cervical glands or those higher up. It is the abundant glandular secretion in connection with the hyperemia that brings about the erosion and swelling of the epithelium.

Accordingly, the glandular inflammation should receive attention, which, if relieved, will also carry with it the disappearance of the erosion. In that form dependent on cervical catarrh I have cured granular erosion by deep ligation of the cervical tissue on either side at the cervico-vaginal junction. For this purpose I prefer catgut, but, if any other material be used, it should be removed on or before the fifth day to avoid pressure atrophy of the tissues embraced in the loop of the ligature. I received my cue for this method of treating granular erosion from the fact that I had frequently noticed the erosion to disappear from the distal extremity of the cervix after trachelorrhaphy. Simple erosions, such as arise from the mechanical irritation of a pessary, or from the pent-up secretions incident to the wearing of a womb-veil, are quickly cured by removing the cause and keeping the parts clean.

Glandular polypi may be excised without the use of an anesthetic. After the bleeding is checked by compression or the use of a styptic,

Fig. 136.—Uterine Dressing Forceps, for Wiping away Secretions and Applying Tampon.

of which adrenalin is one of the most efficient, the base should be cauterized with fuming nitric acid.

The most important inflammatory lesion of the cervix, both in its immediate and remote effects, is that of cystic degeneration. It is but a short step from cystic degeneration to epithelioma, and consequently effectual measures for the correction of this condition should be instituted without delay. If the follicles be few and superficial, they may be punctured, their contents expressed, and the wall cauterized. If multiple and deep seated, the flap amputation of the cervix should be done. In all cases where the cervix is enlarged and indurated from interstitial deposit, blood-letting by deep puncture should be occasionally resorted to. The blood may be encouraged to flow by the application of the artificial leech, or better by a stream of moderately warm, but not hot, water. This, in conjunction with the weekly or semiweekly application of the strong tincture of iodine

to the exposed vaginal portion of the cervix, and the daily use of the hot douche, will result in a diminution in the size and a softening of the cervix.

TUBERCULOSIS OF THE CERVIX UTERI.

Tuberculosis of the cervix is much more frequent than is generally supposed. Routine microscopic examination of the diseased cervical tissue has made this evident. The disease is usually secondary to tuberculosis elsewhere, but may exist in an independent and primary lesion. The source of infection is sometimes from

Fig. 137.—Buttle's Spear for Puncturing the Cervix.

above (the peritoneum or Fallopian tube), sometimes from below (through traveling bacilli, infected semen, contaminated fingers or instruments), or it may be borne on the blood-stream. It presents under three forms: miliary; caseous, or ulcerative; and papillary.

1. **Miliary Cervical Tuberculosis** first makes its appearance under the epithelium of the cervical canal. The tubercles are so minute as to be invisible to the naked eye. As a result of their presence the arbor vitæ become enlarged and villous, and the case presents the usual phenomena of cervical catarrh, for which it is usually mis-

Fig. 138.—Artificial Leech for Abstracting Blood from the Cervix.

taken. Even at an early stage the tuberculous infiltration penetrates deeply into the cervical tissues, and is always much more extensive than appearances would indicate. The tubercular deposit follows the course of the blood-vessels. It is a noteworthy fact that cervical tuberculosis seldom extends to the uterine cavity, nor corporeal tuberculosis to the cervix. For this there is no satisfactory explanation. If the infection always followed the course of the blood-vessels it would be easily accounted for, as the vascular systems are distinct. The miliary form is that most common to the cervix, and usually persists throughout the course of the disease.

2. Caseous, or Ulcerative, cervical tuberculosis may be regarded as a transition from the miliary. In this the tubercles are larger, become massed, and, as a result of imperfect oxygenation from inadequate blood-supply, undergo caseous degeneration and break down into ulcers. The ulcers are scattered over the cervical mucosa and are of variable size and depth. They are covered with granulations, exude an abundant secretion, and bleed readily. Caseous material is frequently found clinging to the floor and sides of the ulcer. This condition is frequently mistaken for malignancy.

3. The Papillary form takes its origin in the arbor vitæ, becomes tumorous, and forces its way to the surface at the margin of the os externum, where it projects as a nodulated mass. Both the ulcerative and papillary forms have been mistaken for cervical cancer, and the uterus extirpated under that belief. They may usually be differentiated from cancer by the deeper color, the absence of pain and offensive discharge, the absence of induration, the presence of caseous matter, and the smaller disposition to bleed. Of course, the microscopic characters would be entirely distinct aside from the presence of the tubercle bacillus.

Treatment. — The radical treatment consists in removing the uterus and appendages. This is made necessary by the fact that the Fallopian tubes are often involved, even though the physical signs do not indicate any gross changes in them. In cases where, owing to the involvement of other structures, radical measures are inexpedient, palliative measures may be adopted, such as curettage, cauterization, and the use of antiseptics and detergents.

HYPERTROPHY OF THE CERVIX UTERI.

True hypertrophy of the cervix is, for the most part, confined to the vaginal portion. It occurs in two forms: as a lateral expansion or as an elongation. The former is characterized by a bulbous expansion of the cervix, of moderately firm consistence, and an irregular surface. It occurs in virgins, and, so far as my observation goes, is more frequent in blondes. It occasionally gives rise to local and reflex phenomena similar to those of cystic degeneration of the cervix.

Treatment.—Local applications of the tincture of iodine, with an occasional abstraction of blood by deep puncture, and elastic tampons of wool saturated with boroglycerid may be of service. Usually nothing short of amputation will be of any lasting benefit.

HYPERTROPHIC ELONGATION.

The hypertrophic elongation of the cervix, the second form spoken of, is also a true hypertrophy, but, unlike that just described, the cervix elongates without material increase in thickness. It may attain the length of several inches and present at the vaginal orifice. When exposed the unprotected part becomes dry and corneous. This condition is sometimes mistaken for prolapse of the uterus, but bimanual examination, or a sound introduced into the uterine canal, will reveal the fundus at or near its normal level, and, moreover, the vagina will be found of its normal depth. The redundant portion should be excised.

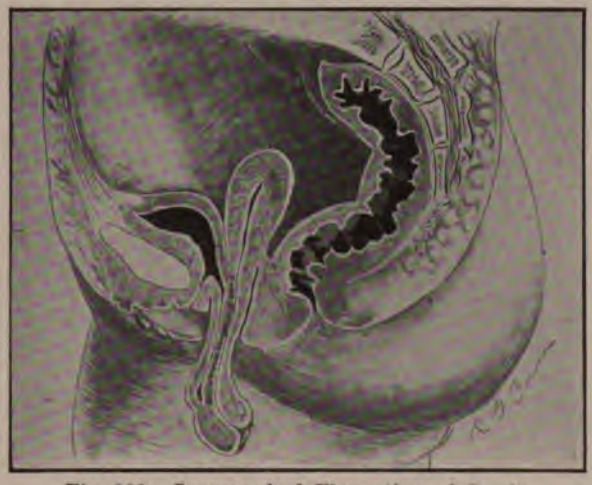


Fig. 139.—Supravaginal Elongation of Cervix.

SUPRAVAGINAL ELONGATION OF THE CERVIX.

This presents many features in common with the above, but it is associated with and dependent on a prolapse of the vaginal wall. The descending walls drag upon the cervix, which, if opposed by the ligamentous attachments above, cause it to be drawn out into a long, membranous canal, so as to be scarcely recognizable to the touch. (Fig. 139.) The os may pass the vulva and appear between the thighs. The vaginal walls invest the cervix, and in proportion to the amount of descent the canal is shortened. Occasionally the canal is completely inverted. Rectocele and cystocele are common accompaniments. Where the parts protrude from the vulva, they are exposed, not only to the desiccating influence of the atmosphere, but

to friction, pressure, and the contamination of the excretions, urinary and fecal. As a result, the cervix and inverted vaginal walls are prone to inflammation, erosion, and ulceration. Supravaginal elongation of the cervix may be differentiated from true prolapse of the uterus by finding the fundus near its normal position, and from hypertrophic elongation of the vaginal portion of the cervix by noting the downward displacement of the vaginal walls. If the woman lie upon her back with the hips elevated, the os will recede within the pelvis and may be pushed up so as to restore the vaginal canal to something like its normal depth.

Treatment.—Some device for lifting and retaining the cervix in its normal position may be tried, which failing, the cervix would be amputated above the vaginal vault,—supplemented, if need be, by a repair of the pelvic floor. In amputating the cervix for either of the conditions above described it should be remembered that involution follows the use of the knife, and it will seldom be necessary to excise all the redundant portion. Usually the excision of two-thirds of that which is seemingly necessary will be found, after the lapse of time, to have been sufficient.

ATRESIA AND STENOSIS OF THE CERVICAL CANAL.

Atresia of the cervical canal may be congenital or acquired. As a congenital affection it seldom exists except in connection with other malformations of the genital organs. Congenital stenosis is found most frequently in connection with the conical cervix. Here a long, tapering cervix terminates at a minute circular os externum. This latter, known as the pinhole os, offers mechanical obstacles to the menstrual fluid, and is consequently often associated with dysmenorrhea. Sterility is also common. Not that the aperture is too small for the passage of the spermatozoids, but because of morbid changes in the canal incident to defective drainage, which renders that passage inimical to the spermatic fluid.

It has been claimed that during sexual orgasm the cervix undergoes a species of erection and ejects the mucous plug which occupies its cavity, and immediately thereafter by aspiration or capillary attraction draws up the spermatic fluid mixed with the alkaline secretions. It is furthermore claimed that the pinhole os, blocked as it is by a mass of mucus occupying the amplified space above, is incapable of ejecting its contents, which contents offer an insuperable obstacle to the entrance of the seminal fluid. As many prolific women

never experience sexual orgasm, it is highly probable that this method of insemination is only one of the many by which Nature safeguards this most important function.

As intimated above, the cervical canal above the external os is usually much dilated by reason of the obstruction. Acquired atresia and stenosis of the cervical canal is the result of sloughing after labor, excessive cauterization in the treatment of cervical lesions, or may follow amputation of the cervix where the stump is not covered with mucous membrane, and where the cervical mucous membrane is not sutured to the vaginal mucosa. I have seen a very aggravated stenosis

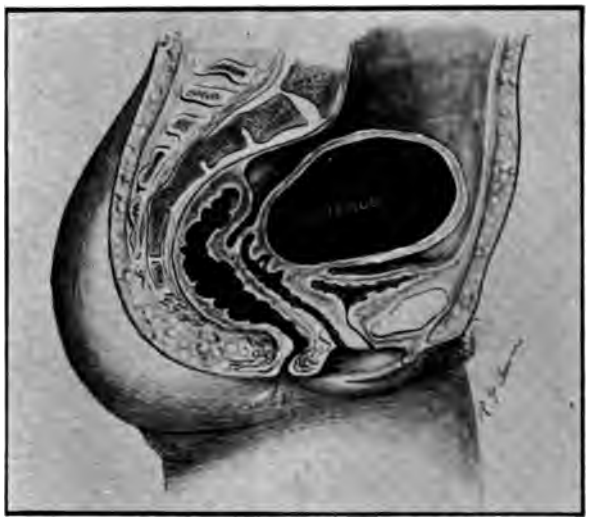


Fig. 140.—Hematometra.

of the cervical canal follow electric treatment. Atresia of the cervix in the menstruating woman results in retention of the menstrual fluid (hematometra). (Fig. 140.) In women who have passed the climacteric there may be no sequelæ unless, perchance, septic infection of the uterine cavity co-exist, when the uterus may become distended with pus (pyometra) or gas (physometra). Stenosis or atresia may affect any portion of the cervical canal, but is much more common at the external os than elsewhere. Stenosis of the internal os is often suspected by the unskilled on account of the difficulty experienced in introducing the sound. As a matter of fact, stenosis of the internal os is of rare occurrence.

Treatment.—In atresia, puncture in the line of the canal, followed by dilatation and the use of a stem pessary when practicable, will be followed by immediate relief; but the tendency to contraction is so great as to necessitate unremitting watchfulness to prevent a recurrence. Amputation by the flap method is decidedly preferable

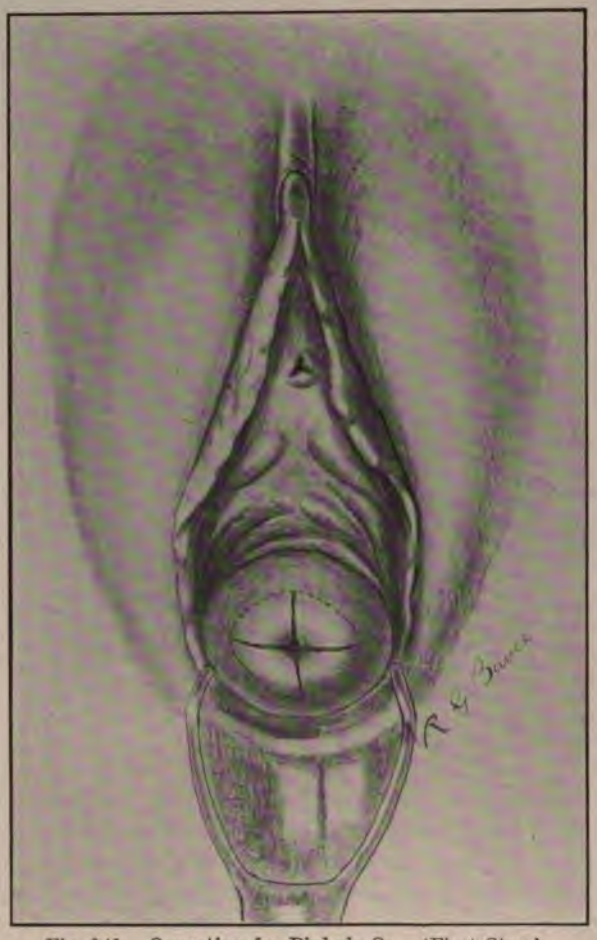


Fig. 141.—Operation for Pinhole Os. (First Step.)

where such a procedure is feasible. In extreme cases removal of the uterus and appendages may be the only recourse. Stenosis of the cervix may be treated by dilatation or amputation. In the conical cervix with a pinhole os it has been customary to enlarge the external opening by removing a circular strip from its margins (Figs. 141 and

142) and suturing the mucosa of the canal to that of the margin of the canal on the vaginal aspect. This is done by making four incisions at equidistant points on its circumference, and then with the knife or scissors removing the intervening tissues.

It may be stated as a rule that a stenosis depending on a loss

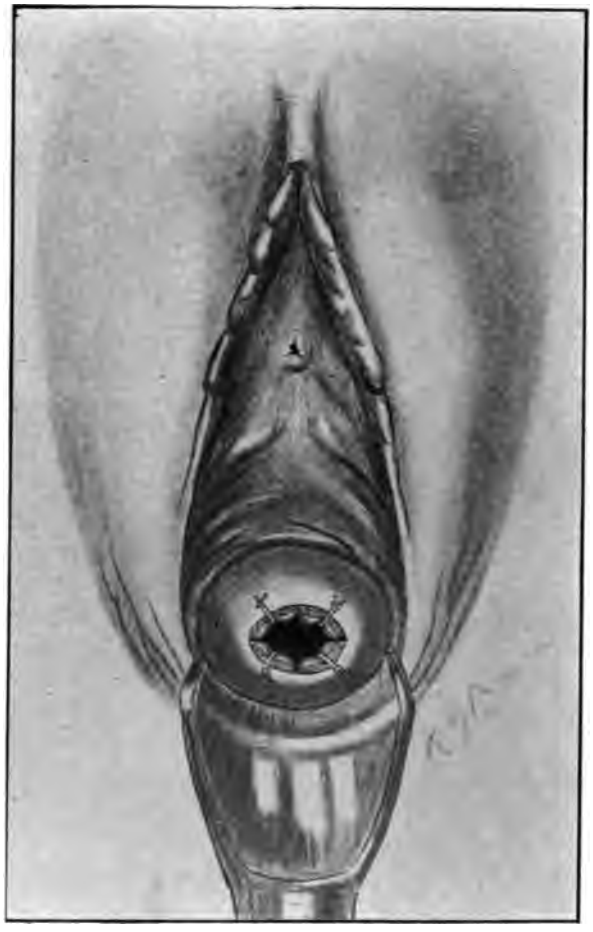


Fig. 142.—Operation for Pinhole Os. (Second Step.)

of mucous membrane from the cervical canal is not amenable to any treatment except that of amputation or linear incision, by which a mucous-lined canal may be found or formed. The special technic by which this is accomplished may be modified to suit the case. For this purpose the vaginal mucosa may sometimes be utilized.

CHAPTER XX.

LACERATION OF THE CERVIX UTERI.

LACERATION of the uterine cervix is of very frequent occurrence. Few women escape the accident in childbirth. Many lacerations are of trivial import and many more heal spontaneously. Nevertheless, a large proportion of child-bearing women give evidence of a pre-existing laceration, either through a want of union or by the presence of scar-tissue.

Causes.—Childbirth is the paramount causative factor of cervical tears. Indeed, so generally is this the case that the discovery of a lacerated cervix in a woman is regarded as almost *prima facie* evidence of motherhood. Tears may, however, occur as the result of forcible dilatation or from delivery of an intra-uterine tumor. Such tears usually heal promptly and leave no trace.

Clinical History.—Laceration of the cervix may occur at any point of its circumference. In the vast majority of instances it takes place at the sides. Occasionally it will occur on the anterior or posterior lip. The claim that lacerations occur as frequently in this latter situation as at the sides is, I believe, purely fanciful and untenable. It may be true, as has been stated, that they heal more readily because held in closer apposition, and it is furthermore true that we occasionally find cicatricial bands extending from the anterior or posterior lip out into the fornices, but these are rarities, and such a thing as an unhealed antero-posterior tear of the cervix, except in the stellate laceration, is almost unheard of. The superior distensibility of the anterior and posterior lips of the cervix, as compared with its lateral segments, are well known to the obstetrician. In the accidental tears of the cervix from forcible dilatation I have never seen but one in the lip, and that occurred in a degenerated cervix. Indeed, the anatomic relations of the parts are such as to favor the lateral rather than the antero-posterior laceration.

Cervical tears as they are found are denominated lateral, bilateral, and stellate. A lateral tear may affect either side of the cervix, but is much more frequent on the left. A bilateral tear affects both sides, but is usually more severe on the left. This increased involvement of the left side is owing to the usual left lateral impingement of the

fetal head. The stellate laceration, as the name implies, is a star-shaped laceration in which three or more fissures are found radiating from the cervical canal. Incomplete tears of the cervix are sometimes met with. These occur from within outward, and do not involve the vaginal aspect of the cervix. If not readily recognizable by the sense of touch, a sound introduced into the canal will find the cleft, and may be felt through the thin membranous covering by the finger placed over it on the vaginal aspect of the cervix.

Old lacerations—and those are the only ones that usually concern the gynecologist—present under two conditions:—

1. As a rent of greater or less depth which has healed over. These are sometimes slight, presenting as a mere depression or notch, sometimes so extensive as to involve the entire length of the cervix. The tissues are soft, flaccid, and—barring the cleft—are natural in appearance and consistence.

2. The cervix is indurated, thickened, everted, oftentimes eroded, and presents the characteristic appearance of cystic degeneration. It is only the second class that demands operative interference, as will be seen later on.

Diagnosis.—The laceration may be evident, or the eversion and retraction of the torn surfaces may be so great as to efface all evidences of laceration to the unpracticed touch or sight. A cicatricial plug in the upper angle of the laceration also serves to conceal its extent. The spreading out and turning backward of the edges of the lacerated cervix, together with the effacement of the angle of laceration, either through retraction or scar-tissue or both, and the pathologic changes by which the raw surfaces assume an ulcerated appearance, for many years misled the profession into regarding the condition as one of true ulceration of the cervix. Its real nature was discovered by Emmet. Nevertheless, a lacerated cervix is usually quite easily distinguished by digital examination. It will be found altered in shape, size, and consistence. Instead of being circular in outline, it will be elongated antero-posteriorly, owing to the separation of the torn surfaces. Instead of the natural rounded extremity of the cervix, it will be more or less flattened. It will be soft and velvety from granular erosion; indurated, nodular, and shot-like from cystic degeneration; and oftentimes present a notch at the angle of the tear, or, in lieu of this, a dense cicatricial plug easily distinguished by the finger. Furthermore, by passing the finger around the margin of the cervix, it will be found bulbous at the extremity, with indurated, upturned edges. The curled-up, projecting margins are

on the antero-posterior aspects. To the eye the exposed surface appears red, raw, and angry, and is even yet inaptly termed ulceration of the womb by the careless or untutored. By seizing the margins of the anterior and posterior lips with tenacula, and bringing them together, the raw surfaces will be turned in and the cervix restored to something like its natural appearance. This is the crucial test when any doubt exists as to the nature of the lesion.

Aside from the physical signs as given under the head of diagnosis, there are few symptoms referable to the laceration itself. But as laceration of the cervix is a prominent factor, directly or indirectly, of many other lesions of the genital apparatus, the symptomatology will depend upon the number and character of the associate lesions. Occurring, as it does, at the time of labor, the normal course of events incident to the puerperium is apt to be disturbed, with a resulting subinvolution of the uterus. Add to this a localized sepsis, and we may have glandular hypertrophy, interstitial growth, granular erosion, and cystic degeneration. Cervical catarrh, increased menstruation, backache, headache, and various phenomena, principally nervous and digestive, are among the most common symptoms. Where the tear has extended into the connective tissue of the broad ligament, the subsequent cicatrization will sometimes give rise to annoying or even severe pelvic pain. Pressure upon the cervix, or movements of the uterus—as in coitus, defecation, and jolting of the body—are attended with pain. In bad cases, sterility not infrequently ensues, or conception is apt to be followed by abortion.

Treatment.—Some gynecologists advocate the immediate repair of all cervical tears. Considering that a very large proportion of cervical tears heal spontaneously, and that comparatively few ever demand or come to operation; that the condition cannot be recognized at this period by the sense of touch, thus necessitating the ocular inspection of all women delivered; and that the operation would entail such an exposure of the recently delivered woman as to add greatly to the dangers of the puerperium, it follows that such a course would not only be unnecessary, but prejudicial to the best interests of womankind. Furthermore, "the cervix immediately after labor is enormously enlarged. It is edematous, tremendously stretched, and stitches put in it at that time hang like car-rings three days later" (Hirst). Only in case of extreme and palpable laceration or to arrest hemorrhage from the cervix is immediate repair justifiable. Neither is it necessary to subject all persistent lacerations to operative interference.

Those of the first class should be allowed to take care of themselves. Lacerations of comparatively recent date, unless very aggravated, should be allowed time to make such amends as Nature, aided by judicious care, may be able to effect. Lacerations in the actively child-bearing woman should be let alone unless there be some urgent demand for interference.

Lacerations of the second class, or those accompanied by eversion, erosion, cystic degeneration, and marked induration of the cervical tissue should be operated on. After the age of forty all lacerations that are not covered by mucous membrane or are attended by marked pathologic changes in the cervix should be operated on. This in view of the fact that laceration of the cervix is regarded as one of the prime factors of cervical cancer.

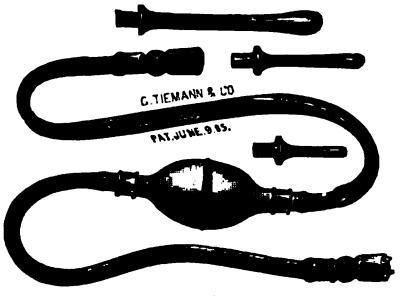


Fig. 143.—Alpha Syringe.

The operation for lacerated cervix will depend upon the conditions found. When all the purposes of operative interference are subserved by it, the Emmet operation is preferable, for the reason that it leaves the cervix more nearly in its normal condition than any other. When, however, the cervix has been irreparably damaged, or when from any reason the Emmet operation is inadequate to restore the cervix to something like its natural form and function, it may be necessary to remove the cervix by amputation, or to excise the diseased portion and form a new cervical canal by turning in the vaginal mucous membrane.

Almost every case of lacerated cervix which calls for operative interference should be subjected to preliminary treatment. The treatment should consist of copious douches of hot water repeated several times daily, the application of Churchill's tincture of iodine to the cervix and vaginal vault once in five days, the abstraction of blood from the cervix by scarification or deep puncture at like inter-

vals, the puncture and evacuation of distended cysts where cystic degeneration exists, and the use of boroglycerid tampons after every treatment. The patient should be kept at rest and the bowels soluble by suitable laxatives.

In many cases a few weeks of such treatment will be followed by a subsidence of the inflammatory symptoms, a disappearance of the discharge, and a softening of the cervical tissues. The improvement in the patient's general condition will be as marked as the local changes. Her aches and pains will have disappeared along with other reflex phenomena, and she will experience such a sense of relief as to lead her to believe that she is cured. The only drawback to this preparatory treatment arises from this fact, and swayed by a false sense of security she will sometimes decline the operation. The improvement, however, is transitory and can only be maintained by constant attention to every detail of treatment, and, unless this be

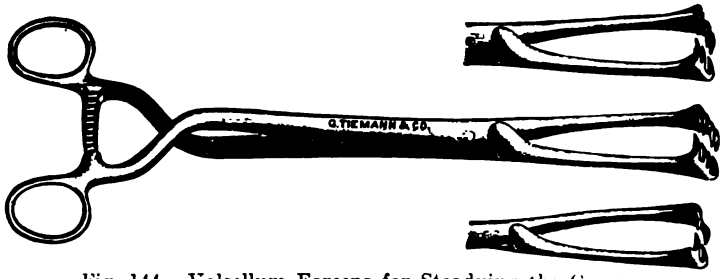


Fig. 144.—Volsellum Forceps for Steadying the Cervix.

followed by operation, the patient soon lapses into her former condition. Whatever of good may accrue from the treatment will be manifest in a few weeks,—from two to six,—and, if at the expiration of that time marked benefit has not been obtained, the case is not one for the Emmet operation.

Emmet's Operation (Trachelorrhaphy). — This operation consists in freshening the torn surfaces and uniting them by suture in such a way as to restore the cervix to as near the natural condition as possible. It will be remembered that the cervical tissues have undergone marked changes, that a plug of cicatricial tissue occupies the angles of the tear, and that it is necessary to provide for a cervical canal. Hence, it is necessary to remove all diseased tissue, not only from the surface of the tear, but also from the angles, even though this latter require deep dissection. It is also necessary to provide for a cervical canal by leaving an undenuded strip along the middle line

PLATE XII.

Dorsal Position, with Author's Perineal Retractor Adjusted.

of the inner aspect of the cervix, and continuous with the canal above. Otherwise a cervical atresia may result.

The patient, being properly prepared and anesthetized, is placed on the table in the dorsal decubitus, the legs supported and the perineum flush with the end of the table. The perineum is retracted,—a self-retaining instrument being preferable for this purpose,—the anterior lip of the cervix is seized with a traction forceps, and the uterus drawn down. The posterior lip is now seized and both forceps

Fig. 145.—Author's Cervical Knife.

adjusted so as to be in the middle line. Instead of the forceps for steadying the uterus, some prefer silk threads of convenient length which have been passed, respectively, through the anterior and posterior lips, the free ends of each being tied together. To denude the surfaces, the tissue to be removed is caught up by a tenaculum at the end of the cervix, and with knife or scissors cut away. This dissection should extend from the tip of the cervix well up into the angle of the tear, and should be long enough and deep enough to include

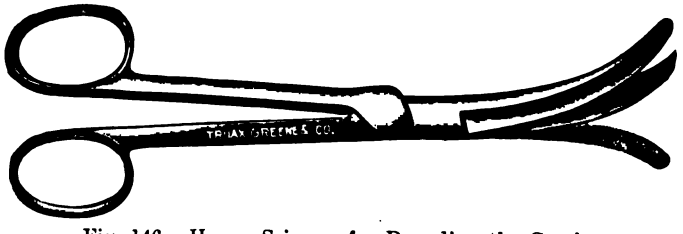


Fig. 146.—Heavy Scissors for Denuding the Cervix.

all cicatricial tissue. Especially is this necessary to remove the reflex disturbances after the parts have united. Many cases of trachelorrhaphy are worse after operation than before, because of imperfect clearing of the angles.

The opposing flap is now denuded and the process repeated on the other side. By passing the finger over the denuded surfaces any hardened areas of tissue will be detected, and should be removed. I have had constructed a knife specially designed for this purpose by which the denudation of trachelorrhaphy can be facilitated. It is

especially serviceable in clearing the angles of cicatricial tissue. A full one-fourth of an inch of undenuded tissue should be left in the middle of each flap for the cervical canal. This strip should be flared at the lower extremity for the os externum. To insure accuracy, some operators mark out the canal by a linear incision on either side before commencing the process of denudation. A common fault among operators is to remove too much of the outer edge of the cervix. The bleeding, though not usually troublesome, is sometimes

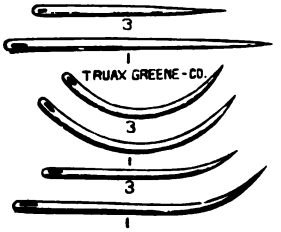


Fig. 147.—Emmet's Cervical Needles.

profuse. This may be forestalled by placing a temporary ligature on either side above the upper angle of the parts to be excised. These should be removed at the completion of the operation. Usually, however, no attention is paid to the bleeding until the denudation is completed, when sutures are placed at the upper angles of the wounds and tied immediately.

From two to four sutures are used on either side, and are passed in such a way as to bring the two flaps of the cervix together and the

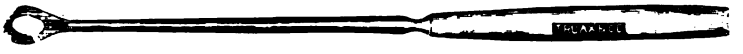


Fig. 148.—Counterpressure.

corresponding raw surfaces into direct apposition. The needle is entered on the mucous membrane of the vaginal aspect of one of the flaps near the edge, is carried under the denuded surface, and emerges on the mucous membrane of the canal near the edge. Returning, the needle is carried under the denuded surface of the other flap from within outward, and emerges on the vaginal aspect of the cervix opposite its point of entrance. The two ends of each suture, after being placed, are secured by clamp forceps to prevent their accidental displacement. The last suture on either side is passed diagonally from the tip of the cervix upward and inward to secure perfect

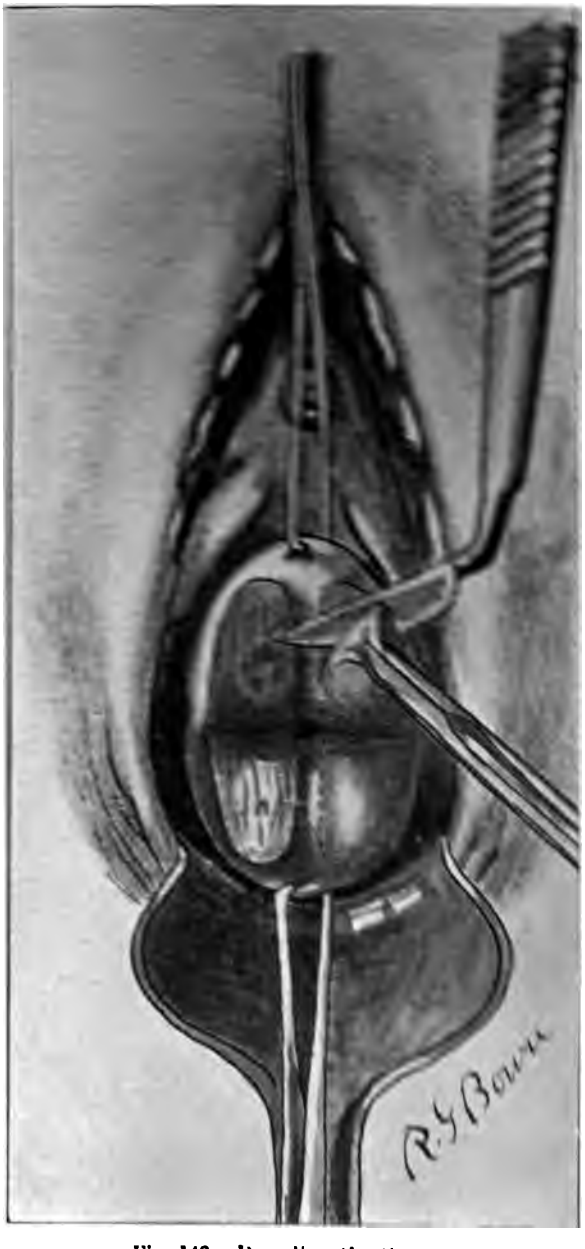


Fig. 149. Denuding the Cervix

coaptation of the extremity. (Fig. 150.) These sutures are tied next in order to those of the upper angle. When all the sutures have been tied (Fig. 151) it is a good plan to gather those of each side into a strand and tie a knot in them at a distance of one or two inches from the cervix and cut them off just below the knot. This facilitates their removal and obviates the possibility of any being overlooked.

Fig. 150.—Trachelorrhaphy. Sutures Placed.
(Emmet's Operation. Second Step.)

Silk-worm gut is the preferable suture material. The sutures should remain from two to three weeks under ordinary circumstances, and much longer—from six to eight weeks—where the pelvic floor has been repaired at the same time. After the operation the vagina is cleaned and dried. Gauze packing of the vagina and the subsequent use of douches, as practiced by some operators, is, I believe, unnecessary.

To repair a lateral tear it is sometimes necessary to slit up the opposite side to render the parts accessible. Stellate lacerations may be repaired separately, or angles of tissue may be cut away, thus reducing the number of surfaces to be coapted. An incomplete lacera-

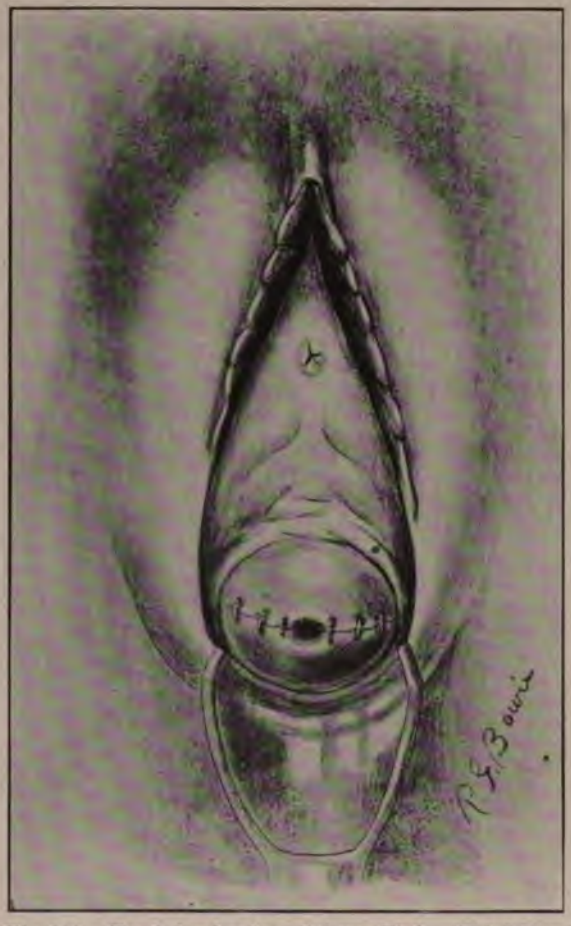


Fig. 151.—Trachelorrhaphy. Sutures Tied. (Third Step.)

tion should be split up and converted into a complete laceration, whereupon it may be treated accordingly.

Schroeder's Operation.—This operation holds the middle ground between amputation of the cervix and trachelorrhaphy. It should never be used when the Emmet operation is feasible, except possibly

in case of the moderately elongated cervix. It is in some instances and in some respects preferable to amputation, in that it preserves at least half the length of the cervix, even where the mucosa is extensively diseased. It consists in splitting up the cervix to the vaginal

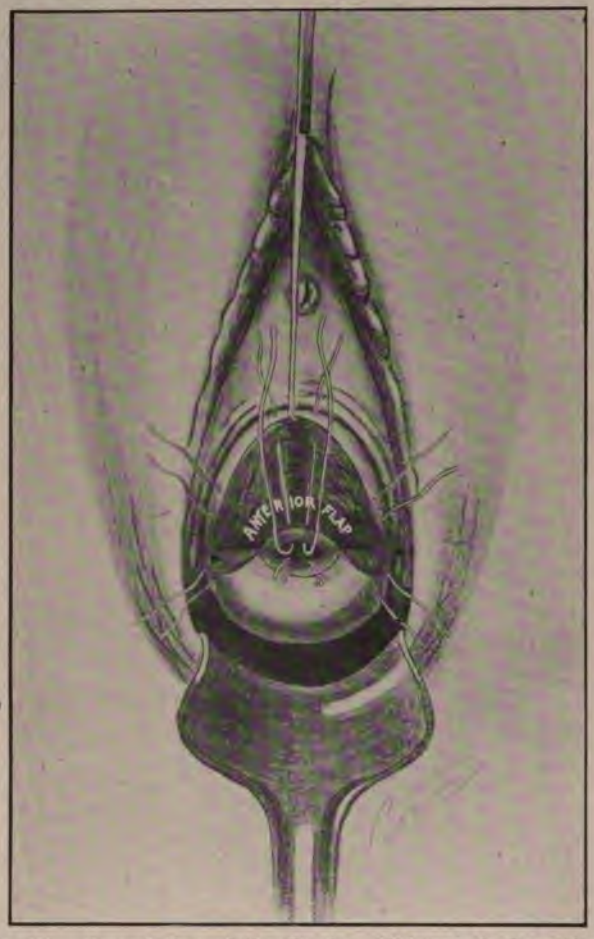


Fig. 152.—Amputation of the Cervix. (Schroeder's Operation.)

vault, making a transverse incision across the mucosa of the posterior lip as high up as practicable, and dissecting off the entire inner surface, which includes the diseased portion, thus leaving a long, thin flap, which consists of the outer or vaginal portion of the cervix. The flap is doubled on itself lengthwise so as to bring the raw surfaces

in contact, the tip of the cervix being sutured to the transverse ledge at the upper angle. The anterior flap is treated in like manner, and, last, sutures are introduced at the sides as in trachelorrhaphy. (Fig. 152.) This infolding of the vaginal mucosa provides for a cervical canal and preserves about one-half the length of the normal cervix in cases which would otherwise call for amputation. Catgut, or some other form of absorbable suture, may be used for the transverse sutures, as they are not easily accessible after the lateral sutures have been placed.

Amputation of the Cervix Uteri.—There are several modes of amputating the uterine cervix, either of which may be called for

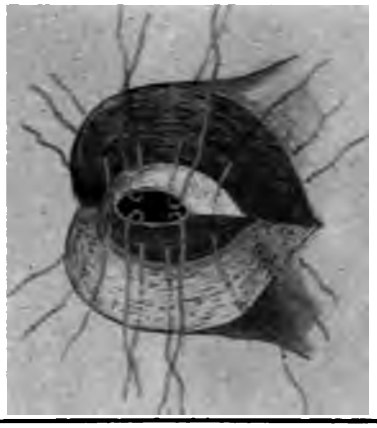


Fig. 153. Fig. 154.

Flap Amputation of the Cervix Uteri (Second and Third Steps.)

under different conditions. The flap operation here described should be the one of election whenever practicable, and when it can be made to meet the needs of the case. Conical excision is open to the objection that stenosis, or even complete closure of the canal, may follow. Square amputation, without covering the stump with mucous membrane, is open to the same objection, while troublesome hemorrhage is liable to follow both methods. The flap operation not only obviates these difficulties, but leaves the parts much more natural in condition and appearance.

For amputation of the vaginal portion, the cervix is split up to the vaginal vault on either side; then, seizing the posterior half with a traction forceps, it is removed by a wedge-shaped incision, the

knife being carried from the vaginal aspect upward and inward, and then from the inner aspect upward and outward, until the two incisions meet. The anterior half is treated in like manner, when it will be found that both halves of the cervix are provided with an anterior and posterior flap, respectively. (Fig. 153.) These flaps are brought together, as in laceration of the cervix, the first stitch being introduced at the upper angle on either side to control the hemorrhage. The mucous membrane of the cervical canal is attached to that of the vaginal aspect by two sutures anteriorly and posteriorly. (Fig. 154.) Where it is desirable to avoid the loss of blood during the operation, temporary ligatures may be inserted on either side of the cervix high

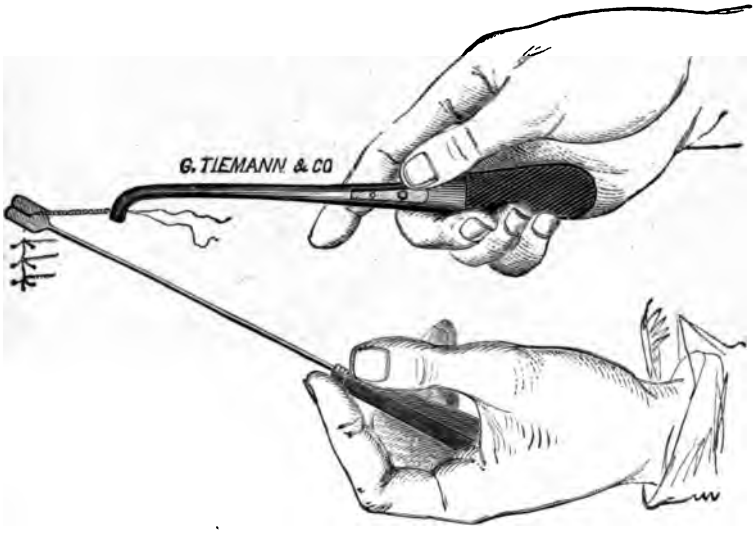


Fig. 155.—Shield and Forceps for Twisting Wire Suture.

up so as to be above the upper angle of the intended incision. These ligatures should be introduced deeply into the cervical tissues and tied firmly. They may be removed at the completion of the operation. The vaginal flap should be somewhat longer than the inner one, as it tends to retract, and is thus liable to result in eversion of the mucous membrane of the cervical canal.

Silk-worm gut is the most convenient suture material, and may be left for two or three weeks or even longer. This gives ample time for firm union, and, if aseptic and not tied too tightly, they seldom cut out. The same may be said of wire. Silk and other non-absorbable suture material should be removed at the expiration of the tenth

or twelfth day. Catgut is not well adapted to this work, as it is absorbed too quickly. Any suture material that has to be removed or is absorbed before firm union has taken place is liable to be followed by retraction of the flaps, thus leaving an extensive raw surface to heal by granulation. Where extensive repair of the pelvic floor accompanies the amputation of the cervix, chromicized catgut may sometimes be used with advantage, thus obviating the necessity of subsequent removal.

In *supravaginal,* or *high, amputation* of the cervix the steps are the same, with the exception that the cervix is freed from its connection with the vaginal vault. This is accomplished as described under the head of "Vaginal Hysterectomy." Here the circular edge of the vaginal mucous membrane should be stitched to the stump of the cervix in such a way as to form a covering for it, leaving, of course, a central opening for the cervical canal.

CHAPTER XXI.

CANCER OF THE CERVIX UTERI.

In cervical cancer woman finds the sovereign affliction of her sex. In the sum-total of misery, loathsomeness, hopelessness, mental anguish, and fatality it exceeds all others. The cervix uteri is affected with cancer more frequently than any other portion of the body. It is estimated that about one-third of all women who die of cancer are the victims of uterine cancer.

Causes.—Cancer of the cervix is pre-eminently a disease of the child-bearing woman. Not only so, but the liability of the disease is in direct proportion to the number of children borne. Statistics show that the subjects of cervical cancer have each, on an average, borne five children. Virgins and nulliparous women are practically exempt from cervical cancer, though, as will be seen later, they are more subject to cancer of the body of the uterus. While there are exceptions to this rule, the exceptions are not so numerous as appearances would indicate, as the unmarried woman will sometimes conceal the fact that she has given birth to a child. In other instances the cancer has followed an injury to the cervix, such as might occur in dilatation. Of late years it has been the fashion to ascribe cervical cancer to the secondary effects of a lacerated cervix, especially that form attended by eversion and erosion.

The constant irritation to which the torn cervix is subjected by bodily movements, and especially in coition, is supposed to act as the exciting determining factor. There can be little doubt that the cervical tear plays an important rôle in the production of cervical cancer, but that it is the sole, or even principal, cause is questionable at least. A large proportion of the cervical cancers are not grafted on the everted and eroded cervix. Most cervical tears occur at the first birth, and, while it is only just to admit that there may be a repetition or aggravation of the tear with each succeeding labor, the torn and exposed surface resulting from one labor ought to yield a much larger percentage of cancers than statistics show, if the cervical tear was the dominant cause. But women with lacerated, everted, and eroded cervices are not, as a rule, prolific; consequently they are

not the women in whom cervical cancer is most frequent. On the other hand, it is my belief that cervical cancer is due, in large measure, to the contusion and injury to which the cervix is subjected during the passage of the child's head through the pelvic canal, and the repetition of this, as in the multipara, enhances the chances of malignant degeneration in proportion to the number of children borne.

Cancer of the cervix occurs most frequently between the ages of thirty-five and fifty. It may, however, occur at any age from adolescence to extreme old age. It is more frequent in the hard-working woman than in the woman of easy circumstances. But the social condition of the victim is probably not so marked a factor as might seem, as prolificness and poverty often go hand in hand. Women in good flesh and apparently sound health are more frequently the subjects of cervical cancer than the ill nourished. The negress is comparatively immune.

Origin and Progress.—There are three forms of cervical cancer, depending upon the character of the epithelium from which it takes its origin. The distinction between these forms refers more to the situation of the initial lesion and the direction of development than to any essential difference in the character of the growth. Cervical cancer may take its starting-point from: 1. The squamous epithelium covering the vaginal aspect of the cervix. 2. The epithelium lining the cervical canal. 3. The epithelial cells of the cervical glands.

1. Cancer of the vaginal aspect of the cervix may occur in two forms: as an ulcer or excrescence. The *ulcerative* form in its early stages is not easily distinguished from other ulcers; but, as a true ulcer of the cervix, attended by loss of tissue, is of great rarity, its presence should always excite suspicion. Later, the ulcers assume the characters of malignancy, as evidenced by the raised, hard, lumpy borders; the uneven, necrotic surface, from which issues a purulent ichorous discharge; and the tendency to bleed. The *excrescences* may be in the shape of small, rounded protuberances, or assume the form of a luxuriant, sprouting, cauliflower mass. The cauliflower variety is often of rapid growth, and may attain large proportions, filling the upper portion of the vagina and concealing the cervix. The growths are very friable and vascular, and bleed on the slightest provocation. The usual direction of growth is outward toward the vaginal wall. It may, however, pass upward into the cervical canal or in the direction of the broad ligaments.

2. In the second variety the growth takes its origin in the cervical canal. If seen early, the mucosa will be found infiltrated, and presents a diffuse, plate-like induration, or be studded with small, projecting nodules. Later the epithelium is shed and the cancerous ulcer appears. In some instances where the cervix has not been lacerated, or has been repaired after laceration, the growth may make great headway before presenting at the external os. The trend of this form is toward the uterine cavity, and thus it may insidiously and without outward sign make frightful inroads before being recognized. It may spread toward the broad ligaments or in the direction of the cervical orifice.

3. In this form the cancer first manifests as an irregular mass, or in the form of a nodule or nodules in the cervical wall. From its point of origin the growth makes its way to the surface, either on the vaginal aspect or inwardly toward the cervical canal. Sooner or later this breaks down, and the resultant excavation presents all the characters of the cancerous ulcer. The distinction of the various types of cervical cancer holds only in the earlier stages. Later, when extensive infiltration and ulceration have taken place, the clinical aspects are very much the same.

Fortunately such distinction is not of the slightest importance, as the progress and termination of the disease is essentially the same in all. The cervix is usually enlarged, and at times markedly so. It is hard, more or less irregular or nodular, incompressible, and inelastic. The ulcerated surfaces are uneven, often granular, necrotic, and bathed in an ichorous, foul-smelling secretion. The borders of the ulcers are raised, indurated, and irregular. (Fig. 156.) The degenerated portions of the cancer are friable, and can be easily chipped off with the finger-nail. The detached fragments, when rolled between the thumb and finger, break down and become unctuous and granular to the touch. The sensation imparted has been very aptly compared to that of a ripe pear.

There is usually an odor, most penetrating and abhorrent, emanating from the disintegrating cancer, which, though not distinctive, is very suggestive, and in many instances the most prominent symptom. The odor is not, as many believe, pathognomonic of cancer, as it is sometimes associated with other necrotic processes, and has been noticed in sloughing fibroids, senile endometritis, or in the decomposition of the secretions of the uterus and vagina absorbed by a sponge or tampon which has been left in the vagina too long. This odor is very tenacious, and will cling to the fingers

long after having been brought in contact with the cancerous matter. Deodorization can usually be effected by washing the hands in turpentine and wiping them dry.

The cancerous ulcer is prone to bleed on slight provocation. In some instances the infiltration is very extensive before the process of disintegration commences. In such, the cervix becomes greatly enlarged, bulbous, and irregular. In others, the ulceration keeps

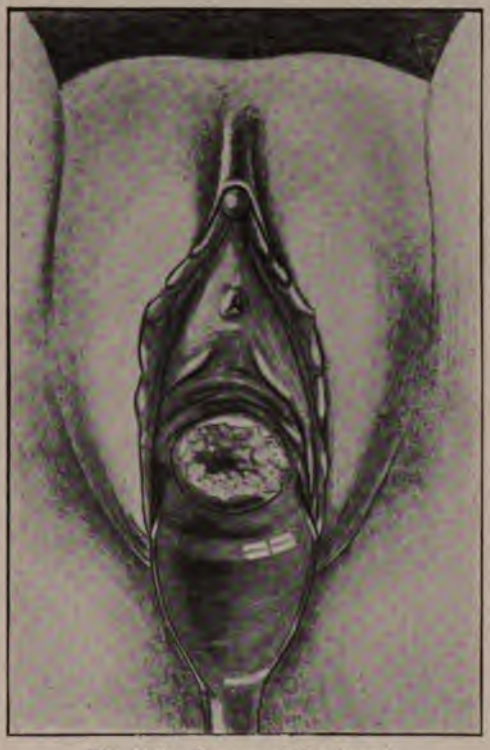


Fig. 156.—Cancer of the Cervix.

pace with the infiltration, and the diameter of the cervix constantly increases until it occupies the greater portion of the vaginal vault. Here the hard, irregular margin of the cervix encompasses a crater-like excavation, which extends upward toward the uterine cavity. Exceptionally the tip of the cervix will not show conspicuous alteration. In such the disease has usually started in the cervical canal and is traveling upward.

In its advanced stages the cancer seldom confines itself to the cervix, nor yet to the uterus. It spreads to the neighboring organs and tissues. The upper portion of the vagina is more or less implicated. The bladder is frequently involved, owing to its proximity to the cervix. This often leads to vesico-vaginal fistula. Extension in the direction of the rectum is less frequent, but occasionally occurs, and leads to a recto-vaginal fistula. Very commonly the cancerous infiltration extends outward into one or both broad ligaments. This direction of growth is so common as to be almost the rule. This produces hardening and shortening of the ligaments and fixation of the uterus. The ureters may be compressed by the surrounding infiltration of the cellular tissue, or their caliber reduced by direct invasion of their walls. This, by impeding the escape of urine, may result in nephrodrosis. The retained renal secretion also gives rise to uremic toxemia.

Cervical cancer shows little tendency to invade the lymphatics, or to affect the lymphatic glands. Occasionally the retroperitoneal glands will be involved, and less frequently the inguinal glands. These glandular involvements seldom occur before the disease has advanced so far as to make their consideration of little importance. Metastasis to remote parts seldom occurs. The belief is quite prevalent among the laity that if the disease is eradicated in one location it will make its appearance in another. In cervical cancer there is almost no ground for this belief. Extension of the cancerous ulcer in the direction of the peritoneum sometimes leads to perforation and peritonitis. This grave complication is happily usually forestalled by plastic exudation, which walls off the cavity from the advancing ulcer.

Symptoms.—The early stages of cervical cancer are, as a rule, marked by an entire absence of symptoms, or, if symptoms exist, they are of such grade and character as to excite little attention and no apprehension. This is unfortunate, as early diagnosis and prompt action are essential to successful treatment. The ordinary symptoms are hemorrhage, pain, and discharge. Either or all of these may be wanting, ill defined, or delayed until the disease has advanced beyond the reach of human skill.

Hemorrhage.—This does not usually take place until the ulcerative period is reached. This, in the superficial ulcerative type, may be at a comparatively early period. In others, especially in the deeper infiltrations, the disease may be far advanced before the symptoms manifest. As a rule, the first manifestation is an increased menstrual

flow. Sooner or later intermenstrual bleedings occur. These usually follow some unwonted exertion or direct injury, such as physical exercise, straining at stool, or coitus. The post-climacteric hemorrhage often appears with such regularity as to encourage the belief on the part of the patient that it is the revival of a dormant function: that she has not, in fact, passed the menopause. Thus, after months or years of exemption a flow will return which will occur at monthly intervals, or every two or three months. The bloody discharge gradually increases in quantity and duration until it becomes a serious menace to the general health. In some instances the loss of blood comes as a mere seepage mingled with the discharges, with now and then a flow of increased severity; in others it dribbles almost continuously, especially when the woman is on her feet. Furious hemorrhages sometimes occur, bringing the woman to the brink of the grave. Death from hemorrhage is, however, of great rarity.

Discharge.—The discharge incident to the early stages of cancer is in nowise peculiar, and is indistinguishable from the ordinary leucorrhea. It is, in fact, an increased secretion from the cervical glands due to the irritation incident to the cancerous infiltration. Later, when the cancer begins to disintegrate, the discharge becomes thin and ichorous, or of a brownish color from the admixture of blood, and malodorous from the decomposed matter which it contains. As a rule, the stench is powerful, penetrating, and utterly abhorrent to the olfactory sense; but there are exceptions, and in some instances it is never troublesome. The discharge is acrid and irritating, and in persons of uncleanly habit is apt to produce excoriation of the parts with which it comes in contact.

Pain.—The pain in cervical cancer varies greatly in different individuals. It seldom manifests early, and is sometimes wanting throughout the course of the disease. Usually it is quite severe in the later stages of the disease, and in some instances is without parallel for atrocity. I have seen the unhappy victim crawling about the room on her hands and knees suffering agonies indescribable. It is lancinating, burning, or gnawing in character, and may be referred to any point within the pelvis. It sometimes shoots upward into the abdomen or downward along the thighs.

Aside from these ordinary symptoms, others may be added of a special character depending upon the involvement of other organs. The infiltration of the bladder-wall before the occurrence of perforation gives rise to vesical irritation with more or less constant tenesmus and frequent urination. Proximity to the rectum usually

presages a more or less obstinate constipation. This may be alternated with diarrhea or dysenteric symptoms. Toward the last diarrhea is common. Ureteral obstruction gives rise to discomfort, sometimes to severe colicky pains, and to uremic intoxication. When the infiltration involves the peritoneum, the sharp, lancinating pains of localized peritonitis are added.

In advanced cancer the abdominal walls are rigid, the intestines gathered in the upper abdominal zone, and the pelvic roof hard. This condition of things is probably due to the peritoneal involvement. Combined with these there are usually anorexia, more or less gastric disturbance, and sleeplessness. The hemorrhage and drainage, the absence of nutrition and loss of sleep, the pain and odor lead to profound anemia and emaciation. Absorption of the decomposed excreta surcharges the system with septic matter. Along with anemia, emaciation, and cachexia, a lemon-hued skin may characterize cancer in this, as in other situations.

Diagnosis.—In the great majority of cases cervical cancer is not recognized until it has made such headway as to place it beyond the pale of successful treatment. It has been taught that the uterus, by reason of its isolation, is the most favorable site for cancer, in that the disease is confined within definite limits, and, therefore, can be more easily eliminated. While this may apply to cancer affecting the corporeal cavity, it in no sense applies to the cervix, for it is a very short step from the cervix to the vaginal vault, the broad ligament, or the bladder, and this step is almost invariably taken at a very early period. In view of the vital necessity for early diagnosis it is lamentable that we have no criteria by which we can recognize cervical cancer in its incipient stage. Women should be taught to view with distrust any hemorrhage which is unnatural as to time or quantity, as also any unusual discharge. There are, however, so many conditions of trivial import which give rise to hemorrhage or discharge, and it is so often the case that the gynecologist cannot assign a definite cause for the same, that she has learned from experience to disregard them unless inordinate in quantity, or accompanied by other and more impressive symptoms. If, obeying the injunction of the medical attendant, she has reported to him on a number of occasions and finds that her apprehensions are unfounded, she finally settles down into the belief that the cry of "wolf" is a false alarm, and serenely awaits the issue. This is all the more apt to be the case with the initial hemorrhage of cancer, in that it is unattended with the slightest distress, whereas in

most other instances the inflammation or congestion which is the causative factor gives rise to more or less discomfort. Nevertheless, the doctrine should be inculcated and forced upon the attention of the woman, that every hemorrhage unnatural as to time or quantity is pathologic, and may be ominous of the direst consequence. Better still would it be if all women between the ages of thirty-five and sixty could be looked after at regular intervals by a competent gynecologist.

Some of the conditions with which a cervical cancer may be confounded are: erosion with laceration, syphilitic or tubercular ulcer, cystic degeneration, cervical fibroid, and a sloughing uterine polypus.

An easy method of distinguishing erosion from cancer is the tenacity and toughness of the velvet-like covering. It cannot be chipped off with the finger-nail, or, if so, does not break down when rubbed between the fingers. Heitzmann believes that we have in the solution of sulphate of copper an almost unfailing aid to the diagnosis of incipient, ulcerative cervical cancer. According to him, the application of a 10-per-cent. solution of the sulphate of copper to the cancerous ulcer will produce bleeding, whereas the same solution applied to the simple erosion will result in a bluish-white coating without bleeding. The older erosions are to be distinguished by the absence of the hard, elevated, irregular margins and foul secretions of cancer.

Syphilitic and tubercular ulceration of the cervix is so rare as compared with cancer that the presumption would be in favor of the cancer. In general appearance these ulcers often closely resemble that of cancer. If, after evoking the history of the case, syphilis be suspected, antisyphilitics should be tried; if lupus be suspected, the electric light treatment might be given a trial. Should the ulcer fail to be benefited under this *régime,* the case is presumably one of cancer. The microscope should not be ignored, nor its use too long deferred.

In cystic degeneration the cysts may be seen and their contents expressed after puncture. Fibroid tumors of the cervix are much more rare than cancer. The tumor is usually single, more clearly defined, smoother, and not so intimately blended with the tissues as the cancerous nodule. It is also denser and usually larger. A sloughing polypus is more friable than cancer and by careful examination the healthy cervix may be found encircling its pedicle.

In the initial stage, and as a means of differentiation at a later period, the microscope may afford valuable assistance. Liberal sec-

tions should be taken from the suspected part, including some of the healthy tissue. Scrapings are unreliable, for the reason that they include only disorganized tissue which may as well represent one degenerated process as another. These sections may usually be made without the aid of an anesthetic, as the cervical tissues are not very sensitive. Wedge-shaped pieces may be excised from the cervix and the gap closed by suture, or, if necessary, the entire cervix may be amputated for the purpose of examination. The specimens should be placed in alcohol until they can be turned over to the pathologist. Not a few gynecologists, among whom are some of the most eminent, place little reliance on the microscope as an aid to diagnosis in cervical cancer, and rely chiefly on the clinical features. The efficiency of the microscope will depend very much on the man who is back of it, and, though invaluable at times, it must be admitted that many and grievous errors have been committed through its use. As between the two, in general I would rather trust the clinical than

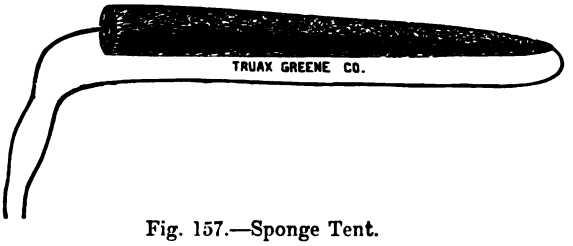


Fig. 157.—Sponge Tent.

microscopic evidences of cancer of the cervix, but would avail myself of both to make assurance doubly sure.

It should be remembered that cancer of the cervix is an infiltration, and not a growth by accretion; that the cancerous mass is ill defined, immovable, incompressible, inelastic; that it offers a dead resistance to compression, and yields only when its tissues are crushed. It is incapable of stretching, and consequently that portion of the cervical canal which it occupies cannot be dilated. Another feature of the cancerous deposit which distinguishes it from the inflammatory is its inabsorbability. These attributes of the cancerous deposit may be made use of to distinguish it from other deposits.

It is well known that the indurated cervix of chronic inflammation may be dilated and softened under expansive pressure from the cervical canal. When the pressure is continued long enough, the cervix not only becomes dilated, but the tissues become soft, pliable, and devoid of lumpiness or uneven patches. That portion of the

cervix occupied by the cancerous infiltration will neither yield to dilatation nor yet become softened under its influence; hence dilatation of the suspected cervix affords a valuable means of differentiation between the cancerous and inflamed cervix. Rapid dilatation is not so well adapted to this purpose as the gradual dilatation effected by the sponge or laminaria tent.

Should the cervix be torn and the suspected deposit be in the everted lip, one or two sutures should be introduced through the anterior and posterior lips on either side so as to bring them in apposition, and after introducing the tent, tied so as to temporarily restore the cervical canal that the effect of pressure on the suspected part may be noted. No paring should be done as in trachelorrhaphy, and the stitches should be removed as soon as the test is completed. This will not require an anesthetic, though it should be conducted with scrupulous antiseptic detail, and the woman should be kept in bed during the period of dilatation and for a day or so afterward.

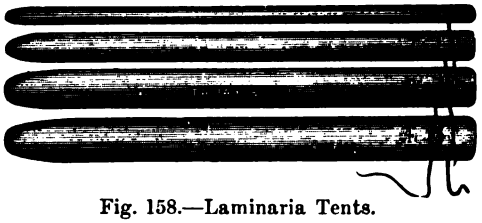


Fig. 158.—Laminaria Tents.

A hard, lumpy, irregular cervix should always be an object of distrust, and should be subjected to every known test until satisfied of its character. Advanced cancer may usually be recognized by the unaided senses. The irregular excavation, the tendency to bleed, the foul-smelling discharges, the cachexia, and the complex of symptoms referable to the involvement of adjacent organs make a picture so distinctive of cancer as to be unmistakable.

Course and Termination.—Cervical cancer usually runs its course to a fatal termination in from one to two years. To this there are exceptions in which the case may terminate in a few weeks or months, or extend over a period of years. Very rapid growth is apt to occur in the young and well nourished. Death is usually the result of a combination of causes: anemia, exhaustion, inanition, septicemia, and uremia, each and severally playing a rôle. Hemorrhage, though often alarming and always debilitating, seldom kills. Peritonitis is infrequent. Many patients sink from exhaustion, worn out by pain,

hemorrhage, discharges, insomnia, and inability to take and assimilate food. The noisome stench of which the patient is sensible, and about which she is acutely sensitive, helps to round out her burden of woes and wear her life away. Uremia is probably the most constant single factor in sealing the fate of the victim. It comes like a benediction to soothe the last hours of the wretched sufferer, who, under its lethal influence, moves to her final rest with benumbed sensibilities and clouded intellect.

CHAPTER XXII.

TREATMENT OF CANCER OF THE CERVIX UTERI.

THE treatment is radical or palliative. The radical treatment consists in the removal of the entire organ, with as much of the adjacent tissues as may be deemed necessary—within practicable limits—to insure complete eradication of the disease. Palliative treatment is resorted to in such cases as have passed beyond the reach of the knife.

"The less the disease, the greater the operation" used to be an expression very much in vogue. This apparently paradoxical *dictum* was founded on the fact that in advanced cancer complete eradication was out of the question, and consequently radical measures were either impracticable or inexpedient, as involving greater risk than the results would justify. Furthermore, anything less than total extirpation of the uterus for cervical cancer in the earlier stages was manifestly unwise in the light of the oft-demonstrated fact that secondary foci of disease were frequently to be found in more or less remote parts of the organ when the primary infiltration was apparently confined within narrow limits. Neither is it possible by the unaided senses to define the boundaries of the primary infiltration. As a rule, it may be said that the involvement of the vagina, bladder, rectum, or broad ligaments is a contra-indication for the radical operation. Modern surgery has, however, essayed to cope with many of these complications, individually or collectively; so that the limitations of the radical procedure are not clearly defined. Practically, however, and taking into consideration the capabilities of the average surgeon, radical extirpation should not be attempted when the disease has passed beyond the confines of the uterus.

Gross involvement of the vagina will be recognized by the eye; that of the bladder or rectum by the functional disturbance and by the sense of touch. When the cancer has invaded the broad ligaments they are rendered thick, hard, and inelastic, and can be felt at the sides of the uterus, which they hold rigidly in one position. The old rule used to be that a uterus that could not be drawn down to the vulva was not a fit one for the operation of extirpation. This is a safe working rule; but occasionally the uterus and appendages are

bound down by inflammatory adhesions which in themselves are no bar to the operation. These can usually be differentiated by excluding the palpably thickened and indurated ligaments.

RADICAL TREATMENT.

The radical treatment for cervical cancer involves the removal of the uterus. This may be accomplished *per vaginam*, through abdominal section, or by a combination of the two, which is designated the "combined method."

Vaginal Hysterectomy.—In the operation of vaginal hysterectomy all aseptic details should be followed as scrupulously as in any

Fig. 159.—Irrigating Stand.

other intraperitoneal operation, and for the same reasons. In the way of preliminary preparation special attention should be given to the vagina, pudendum, and its environments. After shaving the pudendum, it and the surrounding parts, including the lower portion of the abdomen, perineum, and inner aspect of the thighs, should be thoroughly scrubbed with soap and water, rinsed in plain, sterilized water, and again washed with a 1 to 2000 solution of bichlorid of mercury. The vagina should be irrigated first with plain water, then with a 1 to 4000 bichlorid solution, and loosely packed with gauze. Should the cervical tissues be disorganized or the seat of a cauliflower excrescence, these should be removed by the curette and carbolic acid

applied to the raw surface. It is seldom necessary to give an anesthetic for this part of the operation. After the patient is placed on the table and under the influence of an anesthetic, the vagina should again be thoroughly scrubbed with a 5-per-cent. solution of creolin in a solution of green soap of the consistence of molasses, and then irrigated with plain, sterilized water.

Operation.—The patient is placed in the dorso-sacral position, the buttocks projecting a little beyond the end of the table, and the

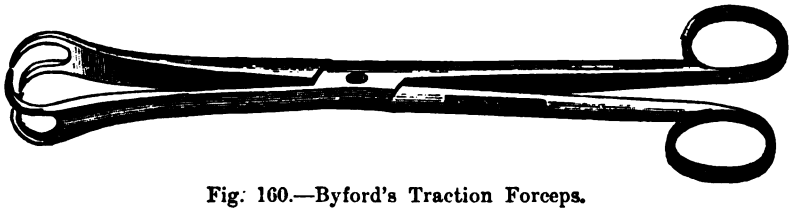


Fig. 160.—Byford's Traction Forceps.

thighs flexed. The legs may be intrusted to assistants or supported by leg-holders. The exposed portions of the thighs, buttocks, and lower abdomen are covered with sterilized towels or swathed in gauze bandage. Slight elevation of the hips, as in the modified Trendelenburg position, conduces to ease and celerity of operation by keeping the intestines out of the way and in bringing the field of operation within direct line of the vision. I first called attention to this ad-

Fig. 161.—Bernays's Uterine Tractor for Insertion within the Canal.

vantage at the Baltimore meeting of the American Medical Association in 1895, since which it has been quite extensively adopted.

A perineal retractor being introduced, the cervix is seized with a strong-toothed forceps and drawn downward and forward. An incision is then made through the posterior vaginal fornix, extending from one side of the cervix to the other. The dissection is carried through the cellular tissue to the peritoneum, which is caught up by a rat-toothed forceps and snipped with the scissors. With a finger

thrust into the peritoneal cavity as a guide, the opening in the peritoneum is enlarged to the full length of the vaginal incision. (Fig. 162.) Should there be any disposition for the intestines to protrude, a roll of gauze, to which a strong thread is attached, should be inserted into the peritoneal cavity so as to block the opening. The string should be allowed to hang out of the vagina, by which the gauze may be removed at the proper time. The edges of the peritoneum and vaginal wall may now be united by continuous catgut suture, as a safeguard against bleeding; but this is often neglected.

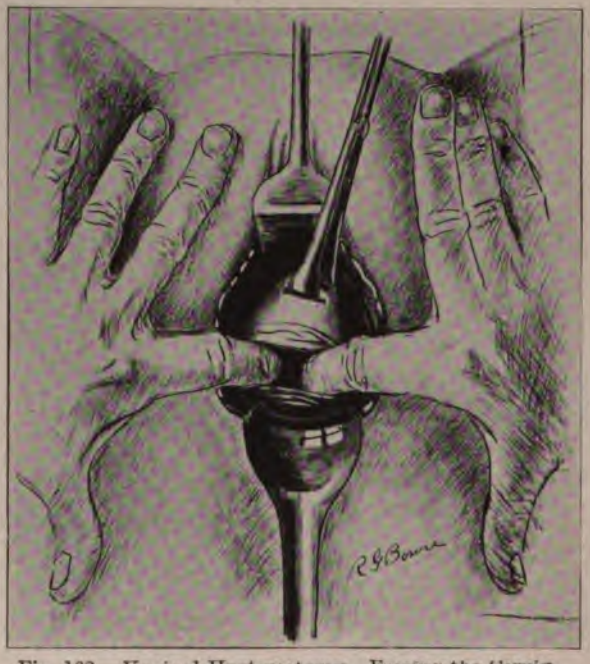


Fig. 162.—Vaginal Hysterectomy. Freeing the Cervix Posteriorly. (First Step.)

The cervix now being drawn backward, and if necessary an additional retractor inserted to lift up the anterior vaginal wall, an incision is carried around the front of the cervix and well out to the sides beyond the ends of the first or posterior incision. This incision should not be so high up on the cervix as to endanger the bladder, and should extend through the mucous membrane down to the connective tissue which forms a stratum between the bladder and cervix. The line of cleavage is through this connective tissue, and under ordinary condi-

tions, with anything like ordinary care, the separation of the cervix and bladder is easily effected with little chance of injury to the latter. If, however, it should be infiltrated, the utmost skill and caution may hardly suffice to avert injury to the bladder.

Having made the initial incision, the dissection is carried forward with the thumb and finger, the bladder being pushed off of the cervix. (Fig. 164.) It is better that the thumb or finger-nail be kept next to and closely applied to the cervix, as thereby there is less danger of wandering into the bladder. Unyielding bands may be clipped by the scissors under the eye. When the peritoneum is reached it is caught up, incised, and the opening enlarged as before. Both openings should now be stretched by the finger until they extend well beyond the cervix on either side, and the anterior retractor pushed up into

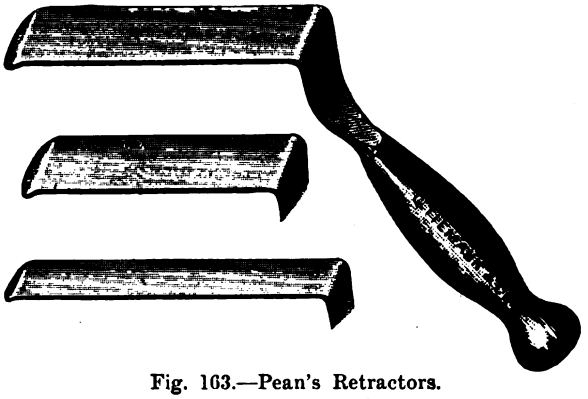


Fig. 163.—Pean's Retractors.

the peritoneal cavity in front of the cervix. This may be made of service in keeping the ureters out of the way in the subsequent steps of the operation.

If necessary, additional retractors may now be placed on one or both sides to facilitate the next step of the operation. The uterus is now drawn down in the axis of the vagina, and the little isthmus of mucous membrane between the anterior and posterior incisions cut through with the scissors. The cervix is now drawn strongly toward the left, and, guided by the fingers, a heavy clamp forceps placed on the left broad ligament so as to grasp the uterine artery. The forceps should be introduced close to the side of the cervix and pressed outward not to exceed one-third of an inch, lest the ureter be caught between its jaws. Pressure toward the patient's left with the anterior retractor at this stage will carry the ureter still farther out of harm's

way. That portion of the broad ligament between the forceps and cervix is now cut through by the scissors and the retractor on that side removed. The cervix is next drawn to the right, and the broad ligament clamped (Fig. 167) and cut as on the opposite side. Some operators prefer an angiotribe, which may be removed in a few minutes.

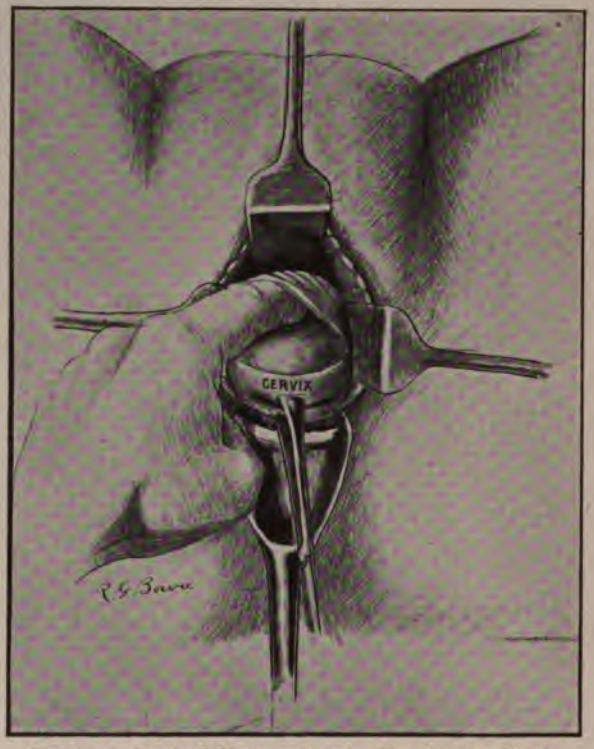


Fig. 164.—Vaginal Hysterectomy. Freeing the Cervix in Front. (Second Step.)

The retractors are now removed, with the exception of the perineal, and the fundus turned into the vagina through the anterior opening. This can usually be done by hooking a finger over it, or, if not, by climbing up the anterior surface of the uterus with toothed forceps, by alternately placing one above the other until the fundus is reached and brought down. During this maneuver, and to facilitate it, the cervix is pushed backward and well up into the vagina. If possible, the ovary and tube of one side are brought into the vagina

and a clamp forceps applied to the ligament external to them and in a direction from above downward, so as to include the ovarian vessels and the intervening tissues of the broad ligament to the end of the clamps first applied. (Fig. 169.) After the clamp is applied the attachments of the uterus are severed on that side. The other side is clamped and the uterus cut away. (Fig. 170.) If the tubes and ovaries cannot be brought within reach of the clamps, the uterus may first be removed by applying the clamps to the uterine extremity of

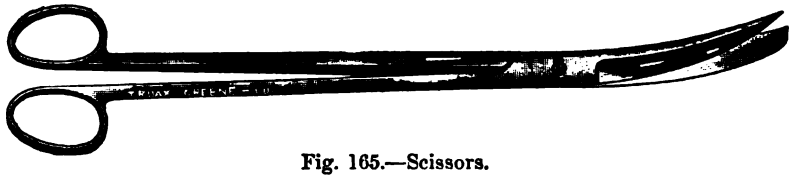


Fig. 165.—Scissors.

the tubes, and the appendages dealt with subsequently. In some cases the operation of vaginal hysterectomy will be facilitated by splitting the uterus longitudinally after clamping the uterine arteries, and removing each half separately.

After the uterus is removed bleeding points are taken up, the gauze removed from the peritoneal cavity, the vagina sponged, and a loose gauze packing introduced up to the peritoneal cavity. The

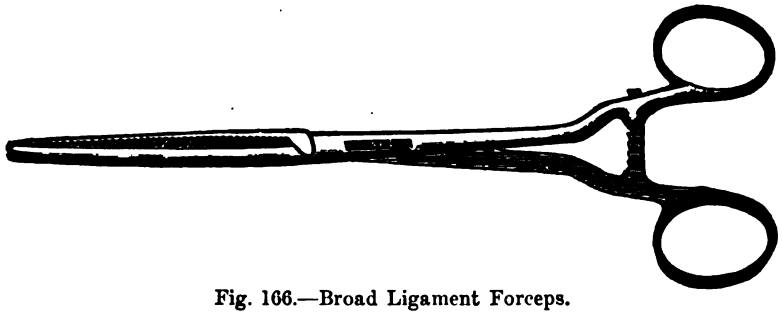


Fig. 166.—Broad Ligament Forceps.

handles of the forceps are securely tied as an extra precaution against their becoming unlocked, and gauze is pushed up between the forceps and vagina to ward off pressure. The forceps may be removed in from thirty-six to forty-eight hours, and the vaginal packing on the sixth day, after which a gentle douche of mild bichlorid solution or other antiseptic may be given. Some operators prefer the use of ligatures to the forceps. Should a non-absorbable ligature material be used, the ends should be left long to facilitate their removal.

Werder's Operation.—Werder, of Pittsburgh, does a total abdominal hysterectomy, and carries his dissections some distance down the vagina. The cervix is then seized through the vagina, and the detached uterus pulled down and cut away, including that portion of the vagina which had been freed by dissection.

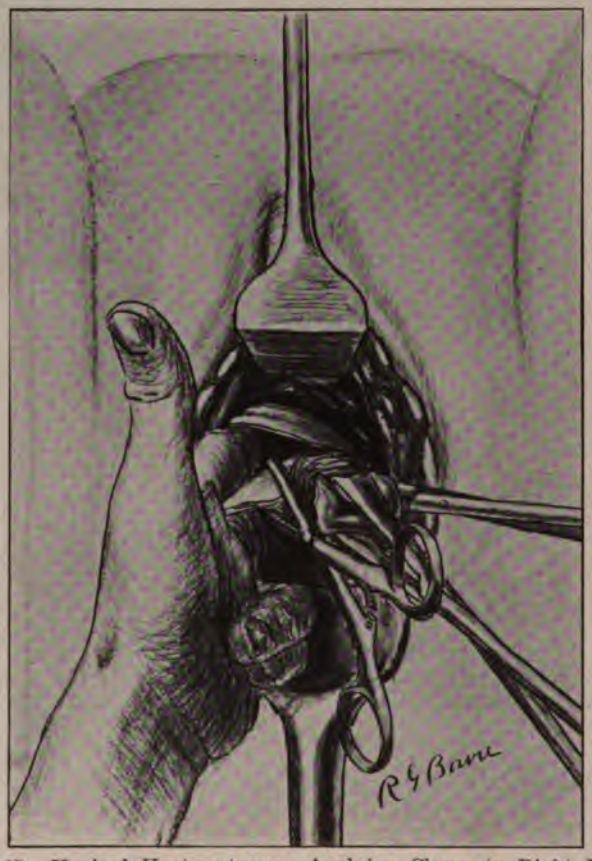


Fig. 167.—Vaginal Hysterectomy. Applying Clamp to Right Broad Ligament, the Left Being in Place. (Third Step.)

Kelly's Operation.—Kelly does a very complete operation *per vaginam* by dividing the uterus into four segments, the segments representing, respectively, the two halves of the body and the two halves of the cervix. As a preliminary to the operation, the degenerated cancerous tissue is curetted away, and the catheters introduced into the ureters as guides. A circular incision is then made

around the vagina about an inch from the cervix, and that portion above the incision dissected up to the cervix. The uterus is now freed in front and behind, as in ordinary vaginal hysterectomy, and a loose gauze packing placed in the posterior opening for the protection of the peritoneum. The fundus is next brought into the vagina through the anterior opening and the uterus split longitudinally through the median line, including the attached vaginal cuff. As the uterus is cut in halves each median surface is caught and held down by toothed forceps. The most affected side is now allowed to retract, while the other half is divided horizontally from within outward toward the broad ligament until the uterine artery is exposed and clamped. Traction is now made on the cervical end of the body of the uterus on that side, while a clamp is adjusted so as to secure the round ligament and ovarian vessels. This segment of the uterus is now cut away.

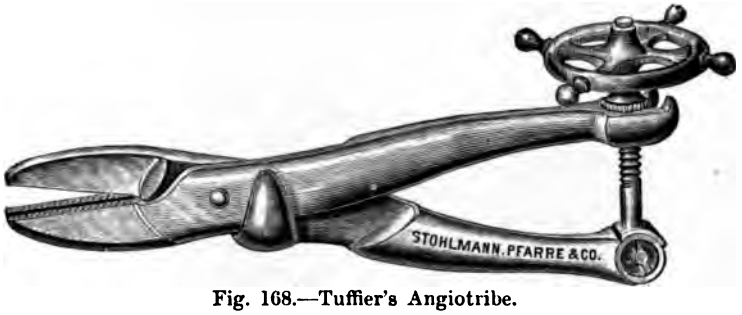


Fig. 168.—Tuffier's Angiotribe.

The other half of the uterine body is next removed in the same way. The uterine vessels are now ligated and the ovaries and tubes removed after ligating the ovarian vessels near the pelvic brim. The clamps are removed as the ligatures are placed. The side of the cervix least affected is next removed, tying the vessels as they are exposed and keeping the finger on the ureter. The remaining quadrant—that side of the cervix where the infiltration is most marked—now remains to be extirpated. The work here must be bold and sweeping so as to get beyond the confines of infection. This delicate work is made practicable by the room gained through the removal of three-fourths of the uterus and its appendages. Should the ureter be implicated, the affected portion should be excised and the proximal end implanted in the upper part of the bladder. For thoroughness and efficiency the operation commends itself, and will doubtless add materially to the life-list in a class of cases heretofore regarded as hopeless.

PALLIATIVE TREATMENT.

When the disease has advanced to such a stage as to preclude its successful removal, the aim should be to retard its progress, abate its most distressing symptoms, and, if possible, to modify its course so as to render the patient as comfortable as possible. This is effected by destroying the degenerated tract and the adjoining tissues as far

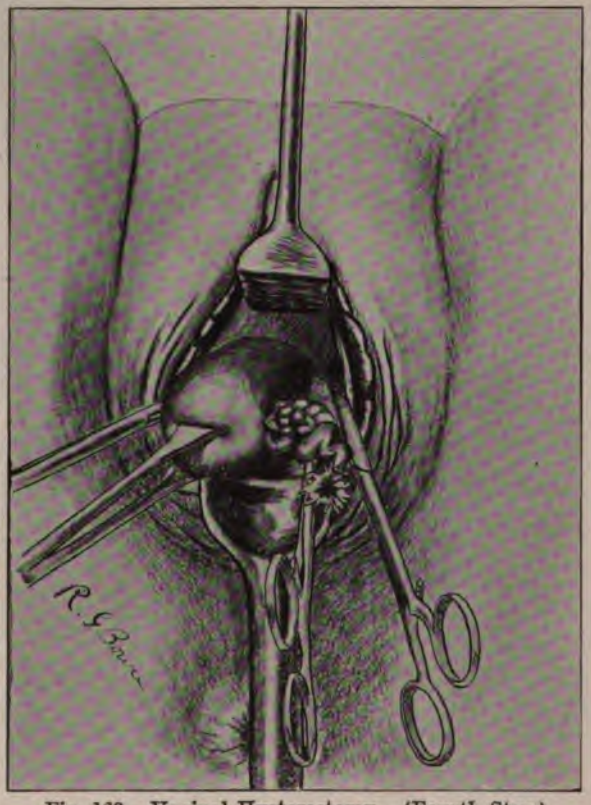


Fig. 169.—Vaginal Hysterectomy. (Fourth Step.)

The fundus has been turned into the vagina and a clamp applied to the top of the left broad ligament.

as they can be followed with safety to the patient. The means adopted for this purpose are amputation, excision, curettage, and cauterization.

Amputation of the Cervix.—This, when possible, should be the operation of choice. This may be accomplished by the knife or electrocautery. Amputation by the knife should extend above the vaginal vault. The first steps of the operations are in all respects

similar to those of vaginal hysterectomy up to the point of entering the peritoneal cavity, which should not, however, be entered. The uterine arteries are tied on either side, the cervix split up on both sides, and, while the womb is held down by traction on the posterior cervical flap, the anterior flap is cut away. A suture is now passed

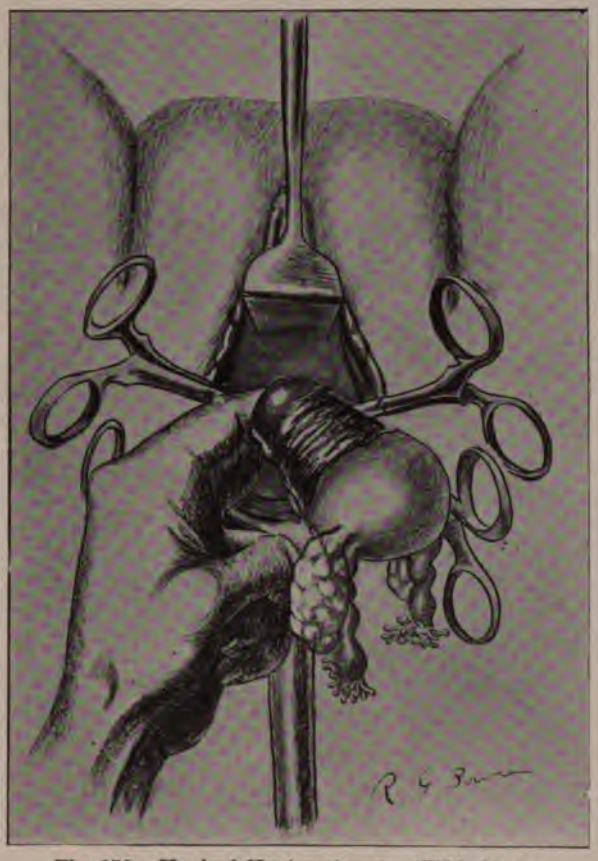


Fig. 170.—Vaginal Hysterectomy. (Fifth Step.)

All the attachments of the uterus have been severed except the upper portion of the right broad ligament.

through the stump from the cervical canal outward, and made to include in its sweep the connective tissue and upper edge of the vagina. This is tied and the ends left long to be used as tractors. Several more stitches may be placed so as to unite the upper extremity of the vagina to the stump of the cervix. The posterior flap is now cut away, and the stump stitched to the vagina. The vagina is washed out and

the cavity packed with gauze, which is to be removed and renewed at intervals of forty-eight hours for a period of eight or ten days. The stitches may be removed at the last dressing, or if of silk-worm gut may be allowed to remain several weeks.

Amputation by the Electrocautery.—This method, as practiced by Byrne, of New York, has yielded most gratifying results. The cervix is seized and drawn down as far as possible, and the slightly curved cautery knife made to encircle it, dividing the vaginal tissues parallel to its outer surface. Then, by giving the upper edge of the knife a slight inclination inward, it is carried around and around, while steady traction is maintained on the cervix until complete separa-

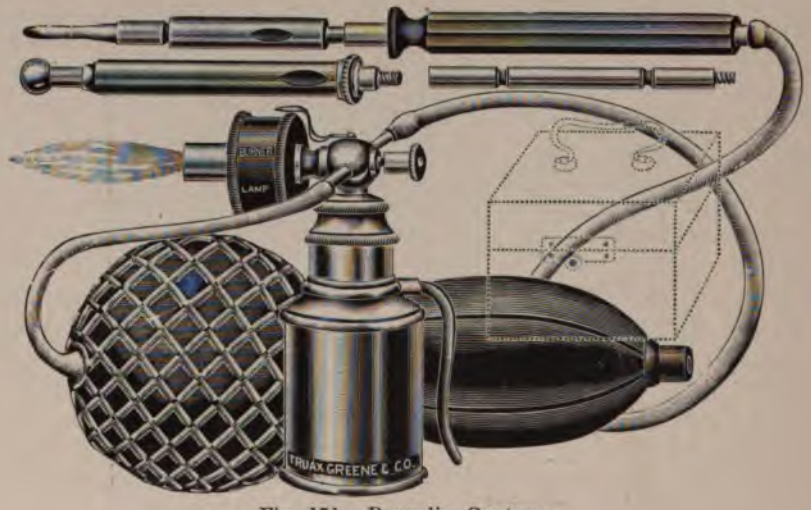


Fig. 171.—Paquelin Cautery.

tion is effected. The part removed is in the shape of a cone, and usually extends as high as the internal os. By seizing the stump the knife can be again applied and another core removed, and so on until the organ is reduced to a mere shell. The knife should never be applied or removed while the current is on, and should not be withdrawn from contact with the tissues until it has cooled, lest hemorrhage follow.

Curettage and Cauterization.—When amputation or excision is deemed inexpedient, much benefit can be derived from curettage and cauterization. After rapidly breaking down the diseased mass by the finger it is scooped away by the curette, the ragged edges trimmed away with scissors, and the entire surface cauterized. The cauteriza-

tion may be effected by the Paquelin or actual cautery or some chemical escharotic. Care should be exercised not to perforate the bladder or rectum, as in so doing a permanent fistula will be left, which, though it may have occurred a few days later in the natural course of the disease, will be attributed to the operation and the blame attached accordingly. The best curette for the purpose is the solid strong curette used in bone surgery.

Aside from the foregoing methods cauterization alone is employed by many physicians, the form of escharotic depending upon the choice of the operator. Nitric acid, chromic acid, arsenious acid,

Fig. 172.—Straight Cautery Knife.

and chlorid of zinc are the chief of the caustics used for this purpose. Pledgets of cotton are saturated with one of these preparations in full strength and the superfluous liquid expressed so as to prevent dripping. These are snugly packed into the cervical excavation and covered by a disk of plain cotton, which is supported by a tampon impregnated with a solution of bicarbonate of soda. This, by neutralizing any excess of free acid, will prevent injury to the vaginal walls. As a precautionary measure it is well to smear the vaginal walls with a combination of vaselin and soda before applying the

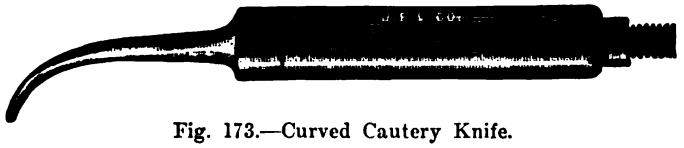


Fig. 173.—Curved Cautery Knife.

caustic. Of late the calcium carbid has been growing in favor as an escharotic. One or two small pieces about the size of a pea are imbedded in cotton or clay and placed against the cervix and held there by the vaginal tampon. Whichever form is used it should be removed in from forty-eight to sixty hours, and followed by a dressing of iodoform gauze, which may be replaced every second day. The slough separates in from seven to ten days.

There are those who oppose any operative interference short of the radical, on the plea that the amendment is but transitory. But when we consider that the large majority of cases fall to the surgeon

too late for radical treatment, that weeks or months of rest, recuperation, and renewed hope may be given to each of these unfortunates, it will require no mathematical calculation to assure us of the inestimable gain accruing therefrom. We not infrequently have the picture of a woman in the full flush of health passing rapidly into decline, with all the accompaniments of advanced cancer. When brought to a realization of her condition, with all that it entails, she lapses into a state of unutterable woe. Her suffering and despair are reflected in her rigid and immobile features, and the ravages of the disease are too plainly told in the pale, wan face and wasted form. She is perchance a wife and mother, with all these names imply. Sad faces and ominous silence betoken the desolation that has invaded the

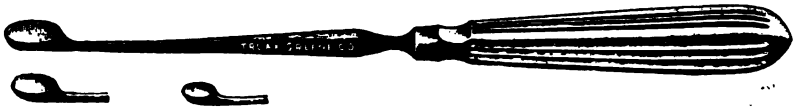


Fig. 174.—Strong Curette for Cervical Cancer.

household. Hope has departed and the only prospect is weary watching and waiting through dismal days and nights for the inevitable. The surgeon comes and goes. The pain, the hemorrhage, the discharge, and the insufferable stench have departed with him. The patient begins to eat, sleep, and takes on flesh and color. She returns to her household duties, is cheery, happy, and hopeful. She is again the wife and mother, and home is home. And when the lapse comes, as it will after weeks or months, perhaps, it comes quite often with bated severity, less pain, less hemorrhage, less discharge, and less of that horrible odor. There is also less of despair and anguish of mind, for the patient clings to a lingering hope born of her former experience, or becomes resigned to her fate, serenely awaiting the issue which is to bring deliverance.

CHAPTER XXIII.

INFLAMMATORY AND INFECTIOUS DISEASES OF THE UTERUS—ENDOMETRITIS.

THE ENDOMETRIUM.

THE histology of the endometrium, or lining membrane of the uterus, is still unsettled. It has always, until recently, been regarded

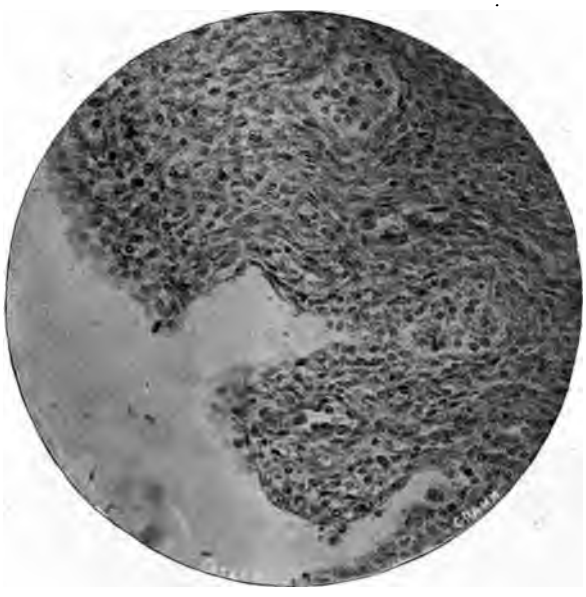


Fig. 175.—Uterus of Girl of Fourteen. × 8 diameters.
(Photomicrograph by Gramm.)

as a mucous membrane. Its situation, the fact that it lines a hollow organ, and its continuity with mucous membrane above and below give color to this view. On the contrary, its firm attachment to and intimate blending with the subjacent muscular layers, the fact that lymphoid tissue has been demonstrated as a component of its structure, its peculiar office, and the nature of its secretions give ground for the belief that it is histologically very similar to—if, indeed, it

be not in fact—a lymphatic gland structure. It is probably a membrane *sui generis*. Notwithstanding, we shall continue to use the

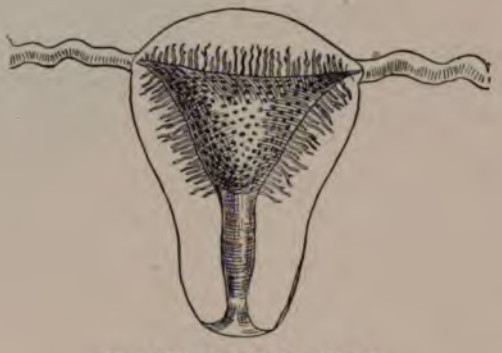


Fig. 176.—Utricular Glands.

old nomenclature and speak of the endometrium as mucosa, and the interglandular structures as connective tissue.

Fig. 177.—Uterine Glands. Normal. (Photomicrograph by Gramm.)

There is probably no structure in the body that presents so many different phases, and undergoes such rapid and marked changes

as the uterine mucosa. In infancy, adolescence, maturity, and the decline of life the endometrium differs so widely in its structural attributes as to modify greatly the pathologic processes that may affect it. The function of menstruation, the condition of pregnancy, and the changes that follow parturition produce marked and even radical changes in the endometrium. Add to these the developmental defects and the results of pre-existing disease, and it will be seen how numerous and multiform are the changes to which it is subject, and how difficult it will be to compass them by any classification that

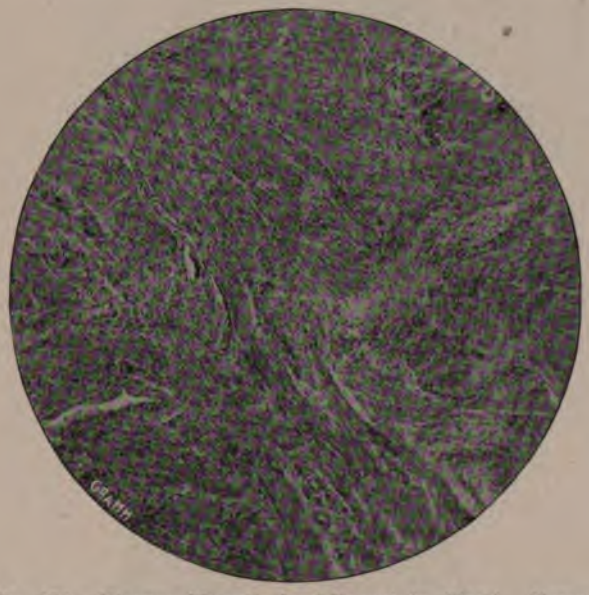


Fig. 178.—Uterus: Muscularis Adjacent to Gland. Normal. (Photomicrograph by Gramm.)

takes into account only one of the ordinary bases of classification: cause, structure, or clinical features.

The normal endometrium in the period of sexual activity is richly endowed with glands, blood-vessels, lymph-spaces, and nerves. It is of moderately firm consistence, about one twenty-fifth of an inch in thickness, and covered with ciliated, columnar epithelium. The utricular glands (Fig. 176) are closely set, dip down into and sometimes extend through the mucosa, and are also lined with ciliated epithelium. They are imbedded in a connective tissue stroma and surrounded by lymph-spaces, blood-vessels, and nerves. The secretion

from the glands is clear, watery, and alkaline. Under ordinary conditions it is barely appreciable in quantity. Under conditions of congestion and inflammation it is increased in quantity and assumes

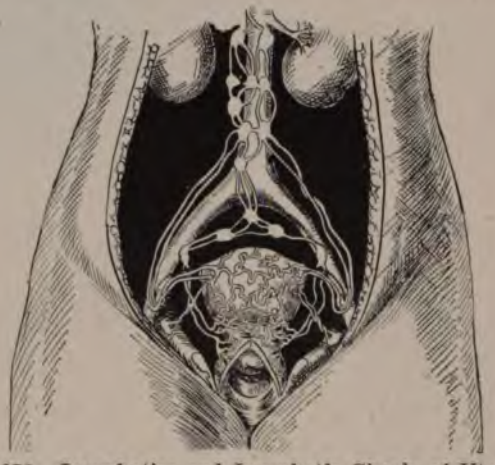


Fig. 179.—Lymphatics and Lymphatic Glands of Uterus.

a milky appearance, owing to the presence of the lymphoid elements. As such it is known as the uterine milk. The lymphoid elements of the uterine milk prevent the coagulation of the menstrual fluid. *The epithelial cells which cover the surface of the mucosa and line the*

Fig. 180.—Lymphatics of the Uterus, Showing Route to Fallopian Tube.

utricular glands are disposed in a single layer. This arrangement is never departed from except in malignant degeneration.

The lymph-spaces which pervade the mucosa and also abound in the muscularis empty into diminutive lymphatics, which form a

delicate net-work in the serosa and, in turn, pour their contents into larger vessels, which pass out through the broad ligament. (Figs. 179 and 180.) A proper knowledge of the lymphatics of the uterus, their course and destination, is essential to an understanding of the graver forms of infective endometritis. In the infantile state the utricular glands are not formed, their future sites being indicated by minute indentations on the surface. In old age they again disappear, and are supplanted by a connective tissue, which is deficient in blood-

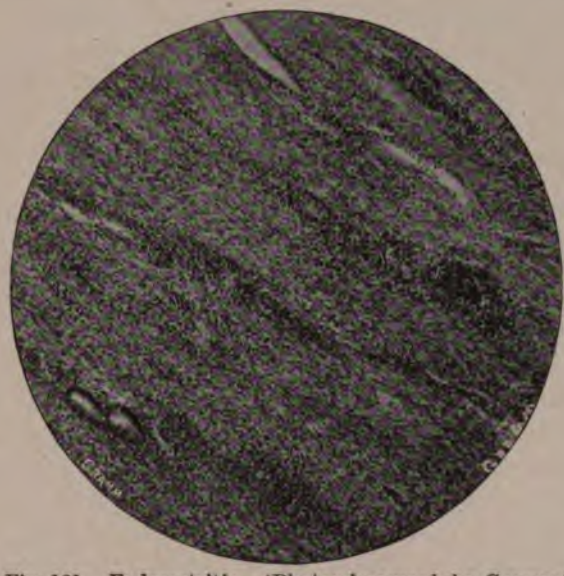


Fig. 181.—Endometritis. (Photomicrograph by Gramm.)

vessels, lymph-spaces, and nerves. In both the endometrium is thin and more vulnerable than in the prime of sexual life.

ENDOMETRITIS.

Endometritis is an inflammation of the endometrium. Strictly speaking, endometritis as a separate and distinct disease seldom exists. The disease, in most instances, extends deeper and involves other structures. The structure and relations of the endometrium make this almost imperative. The endometrium is provided with the same nerves, blood-vessels, and lymphatics as the rest of the organ, and consequently is affected by the same nervous influences, is subject to the same vascular changes, and distributes its products through

A septic infection of the endometrium is often spoken of as *septic* endometritis. The germs usually concerned are the staphylococci and the streptococci. The latter are especially virulent, and are found most frequently associated with the puerperal state. The frequency of this form of endometritis vies with that of gonorrheal origin. A large contingent of the cases met with are traceable to miscarriage. Many women date their illness from the period of confinement. The increased vulnerability of the puerperal uterus is due to the enormous increase of its blood-vessels and lymphatics, which afford unparalleled facilities for the distribution of germs. When the pregnant uterus has expelled its contents it becomes an effete organ and begins to disintegrate. The *detritus* fills the interstices of its walls, freights the lymphatics, and oozes into the uterine cavity. This, together with the clotted plugs of the exposed vessels and sinuses and the residual blood of the cavity, affords an excellent culture medium for germs, which gain access to the deeper structures through the open-mouthed vessels and lymphatics at the placental site or other lesion incident to the parturient effort.

Septic endometritis may be acute or chronic, mild or severe. This form of endometritis furnishes us with more violent and dangerous examples of uterine inflammation, and is farther reaching in its possible consequences than any of the others. The septic germs, especially the streptococci, invade the deeper structures, often involving the entire thickness of the uterus. They enter the lymphatics and are carried to the ovaries and tubes. They are carried into the pelvic cellular tissue, producing *cellulitis;* to the peritoneum, producing *peritonitis;* into the general circulation, producing *septicemia.* It is probable that secondary infection of the tissues beyond the uterus occurs through inflammation of the lymphatics or lymphatic glands which the germs are traversing. In septic endometritis the mucosa is frequently necrotic and ulcerated, and occasionally covered with a diphtheroid deposit. The necrosis, ulceration, and diphtheroid deposit usually occur in patches, but may be diffuse and involve the entire surface. Occasionally the endometrium, or even a considerable portion of the muscular structures of the uterus, are cast off *en masse* as the result of a dissecting ulcerative process.

Modifications in Character and Course.—While most cases of endometritis are diffuse and involve all of the histologic elements, there are some in which the inflammatory process is confined to the glandular structure (glandular, or parenchymatous, endometritis) and others in which the connective tissue or interglandular substance is

affected (interstitial endometritis). In the so-called glandular form the inflamed glands enlarge and project from the surface. They sometimes become polypoid or pedunculated (polypoid endometritis), and as such fill the cavity and encroach upon or push into the cervical canal. In such instances the secretion is abundant, and, owing to decomposition, may become so offensive as to suggest malignancy. A fungoid condition of the endometrium (fungoid endometritis) is due to an overgrowth of both the glandular and interstitial tissues. The fungous elevations are frequently cystic and lined with epithelium. Fungoid endometritis is sometimes the result of inflammatory reaction, but more frequently represents an hypertrophied condition upon which an inflammation has been grafted. Menorrhagia and metrorrhagia are most pronounced in this form.

To all conditions of overgrowth of the endometrium such as have been noted above the generic term of *hypertrophic endometritis* has been applied. Glandular endometritis is sometimes spoken of as *benign adenoma.* Not infrequently a glandular endometritis may be located in one part of the cavity, an interstitial in another, and the mixed form in still another. Sometimes, instead of being overgrown, the endometrium is wasted and thin *(atrophic endometritis).* This especially affects the essential or glandular structure. In such, the glands are wasted or wanting, being supplanted by connective tissue, the membrane thin, exsanguinated, and defective in lymph- and nerve-supply. Such conditions are found in hyperinvolution following pregnancy, in certain disordered states of nutrition, in old age, and the result of long-continued inflammation.

In the endometrium, as elsewhere, the primary effect of inflammation is an increase in bulk, while the ultimate effect is cicatricial contraction. In this way we may have an hypertrophy in the earlier and an atrophy in the later stages of endometrial inflammation. In atrophic endometritis there is a discharge which may be quite abundant, but it contains little, if any, of the natural secretion of the utricular glands; there is occasionally some bleeding, but it is seldom profuse; the blood is prone to coagulate, owing to the absence of the normal secretions; there also exist dysmenorrhea and supersensitiveness of the uterine canal. In the senile form (senile endometritis) the endometrium is sometimes entirely destroyed, the destructive process extending into the muscularis. The discharge is thin, purulent, and sometimes mixed with blood. It is acrid, producing erosions and inflammatory areas on the vaginal and vulvar surfaces. It is, as a rule, very offensive in hot weather or after muscular exer-

cise, and is liable to give rise to apprehensions of malignancy. There is a tendency to contraction of the uterine canal, and it may become obliterated. The vagina and vulvar orifices also become contracted and sensitive. Senile endometritis is usually the result of a pre-existing endometritis carried over into the post-climacteric period.

Symptoms and Course.—The symptoms of endometritis are pain, increased secretion, menorrhagia or metrorrhagia, fever, and reflex disturbances of various kinds. These symptoms will vary according to the intensity of the affection, the condition of the endometrium, and the complications. A simple mild endometritis is seldom recognized, the symptoms being so ill defined. The co-existence of tubal and ovarian disease, displacements of the uterus, flexures, laceration of the cervix, subinvolution, morbid growths, some one or more of which are often associated with the endometrial inflammation, modify and obscure the symptoms.

In endometritis the pain is dull and aching, and is located over the uterus in front or in the lumbar region. It sometimes radiates through the pelvis and extends down the thighs. It is lancinating when the peritoneum is involved, and paroxysmal in case of flexure of the cervix or obstruction of the canal. There is, however, little in the character or situation of the pain that is characteristic, as this is common to inflammatory affections of all the pelvic organs. The secretion is increased in quantity and altered in quality. It is thin, purulent, and oftentimes bloody. It is more abundant in the so-called glandular endometritis. Menorrhagia and metrorrhagia are common. It is sometimes suppressed at the onset of the disease, and in virulent septic endometritis may not reappear. The suppression of the lochial or menstrual flow is generally ominous of evil. The fever is usually slight, but in the acute septic forms may mount to 104 or even 106 degrees. It is sometimes preceded or accompanied by chills. These chills may recur daily or even at much shorter intervals.

The chief reflex phenomena are pain in the top or back of the head, irritation of the bladder and rectum, nausea, and various disturbances of the nervous system, such as hysteria, melancholia, and neurasthenia. The patient is weak, exhausted, and incapable of sustained effort. All the symptoms are aggravated at the menstrual period. The patient also suffers more from being on her feet. Standing is less easily borne by her than being in motion. The weakness and reflex nervous phenomena are out of all proportion to the local lesion.

Examination.—In the severer forms examination will reveal the uterus large, boggy, and tender. The cervix, also, is enlarged, puffy, and not infrequently eroded and granular. From the gaping os issues a thick, tenacious discharge,—that of the cervix,—intermingled with the thin, purulent, blood-discolored discharges from the cavity. By cleansing these away, or by introducing the nozzle of a suction syringe into the cavity, the characteristic secretion of the endometrium can be obtained. The uterine sound will show a patulous canal, an open internal os, and a tender, bleeding fundus. In some instances the uterus is hard and resistant, and not notably enlarged. The cervix is not always implicated in the inflammatory reaction. In the atrophic forms the uterus is diminished in size and the secretion devoid of that milkiness which indicates the presence and activity of the utricular glands.

Diagnosis.—The chief characteristics of an endometritis are the pelvic pain; enlarged, tender uterus; the open cervical canal; the thin, purulent, and blood-stained discharges; and the sensitive, bleeding, internal surface. Microscopic investigation of the curette scrapings affords the most reliable means of differentiating an endometritis from other pathologic lesions of the uterine cavity, or of determining the particular variety in any given case. Owing to the patulousness of the canal, an exploratory curettage can usually be done without dilatation.

Treatment.—In simple endometritis, rest in bed, mild purgation repeated daily, a bland diet, hot sitz-baths, and hot vaginal douches of plain or salt water will usually suffice. When the disease is associated with, or dependent on, some obvious lesion of the uterus or its surroundings, these should receive attention. Malpositions, flexures, and stenosis of the cervix should receive appropriate treatment; polypi or retained fragments of placenta removed; and the lacerated cervix repaired. Morbid growths in or about the uterus and inflammatory conditions of the adnexa may perpetuate an endometritis. In violent non-septic cases, in the absence of positive indications to the contrary, local treatment should be deferred until the pain and tenderness have, in great measure, subsided. In the specific and occasionally in septic forms, curettage is indicated. See "Evils of Curettage in Streptococcic Infection of the Uterus" (page 287). After the removal of the gauze on the second or third day, the hot vaginal douches may be resumed. In gonorrheal endometritis no further intra-uterine treatment will be required.

In the septic forms a continuance of fever calls for repeated

douches. These should be preceded and accompanied by all the aseptic details of an operation. Unless the cervical canal be very patulous, the douches should be administered through a reflux irrigator to insure the unimpeded outflow of the fluids. Serious and even fatal results have followed the neglect of this precaution. The douche may consist of a saturated solution of boric acid, or a 1 to 4000 solution of mercuric bichlorid, once or twice daily. A 1-per-cent. solution of carbolic acid may be substituted for or alternated with the bichlorid solution. Other antiseptics may be used if deemed advisable. The stronger antiseptics should be followed immediately by a plain water douche to prevent their absorption and consequent poisoning. In the graver cases the vital powers should be sustained by nourishing liquid diet, alcoholic stimulants, and carbonate of ammonia. When associated with systemic infection, protonuclein, in 6-grain doses three times a day, will be found useful. In severe cases accompanied by high temperature, an ice-bag may be applied to the hypogastrium. This should be removed in from twenty-four to forty-eight hours, or at any time after the subsidence of the fever. Later, or in lieu of this, a hot-water bag, poultices, or turpentine stupes will be found of benefit. Septic endometritis following parturition may call for hysterectomy to forestall fatal systemic infection, but a measure so radical should not be resorted to in the absence of most positive indications.

In the chronic and subacute forms constitutional measures are of more value than local treatment. Abstinence from marital relations, regular habits, attention to the bowels, open air, sunlight, judicious exercise; loose, light, and comfortable dress; nutritious, plain food; the avoidance of standing, hours of rest during the day, and in inveterate cases change of air and scene, supplemented by tonics, alteratives, and restoratives, will usually accomplish better results than local treatment.

A constitutional taint or diathesis should not be overlooked. Iron, quinine, strychnine, and phosphorus are the remedies most frequently called for. Nevertheless, local measures are often of much benefit and occasionally indispensable. The hot douche once a day and the application of strong tincture of iodine to the vaginal vault once a week, followed by a tampon saturated with boroglycerid and an occasional scarification of the cervix where the hyperemia is marked, are powerful auxiliaries to the systemic treatment. It is seldom necessary and usually hurtful to resort to intra-uterine applications. In my own experience such applications are usually followed

by an aggravation of all the symptoms. I sometimes make an exception to this rule where the cervical canal is straight and patulous, so as to afford an unobstructed exit to fluids and secretions. The intra-uterine applications may be made on a cotton wrapped applicator or by means of the Braun intra-uterine syringe. In hemorrhagic and senile endometritis atmocausis may sometimes be used to advantage.

CHAPTER XXIV.

CURETTAGE, ATMOCAUSIS, AND TUBERCULOUS ENDOMETRITIS.

CURETTAGE.

THE instruments necessary for a curettage are: a perineal retractor, preferably a self-retaining instrument, such as is figured on page 28, a pair of traction forceps, a uterine sound, two pairs of steel-branched cervical dilators (small and large), a sharp curette, a cervical speculum, scissors, applicator, an irrigator, strips of iodoform gauze a

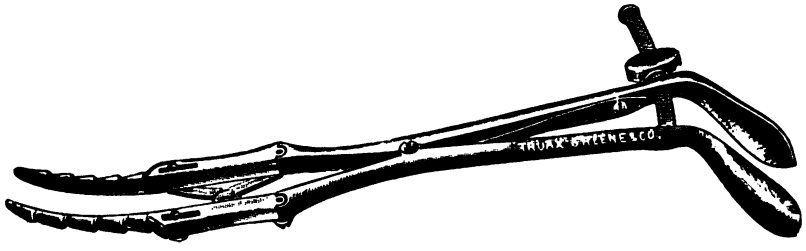


Fig. 183.—Goodell's Cervical Dilator.

yard long and one and one-half inches wide, and some sterilized cotton. The patient is prepared by a general bath, thorough catharsis, and cleansing of the vagina. For the latter a 5-per-cent. solution of creolin in a solution of green soap answers admirably. With wads of absorbent cotton held in the bite of a forceps and dipped in this solution, the vagina is thoroughly scrubbed and irrigated with plain water. It is understood that the surgeon and his assistants, and all instruments and appliances used in the operation, have been properly prepared.

The patient, being anesthetized, is placed in the dorsal position and drawn down so that the perineum comes flush with the end of the table. The thighs are flexed at right angles and held by assistants or leg-holders. Now, if not before, the vagina is scrubbed and irrigated. The perineal retractor is introduced and the anterior lip of the cervix seized by a traction forceps and drawn down. The uterine sound is

introduced to get the direction of the canal, and is immediately withdrawn, to be followed by the smaller steel-branched dilator. Dilatation is effected gradually, first by expanding the blades in one direction and then another until the larger dilator can be used to advantage. This latter should be of the Goodell pattern, with blades which diverge parallel to each other, otherwise serious injury may be inflicted by the diverging extremities of the blades in the uterine cavity. (Fig. 184.)

When sufficient dilatation has been secured—an inch or more—the curette is introduced to the fundus and the entire surface of the

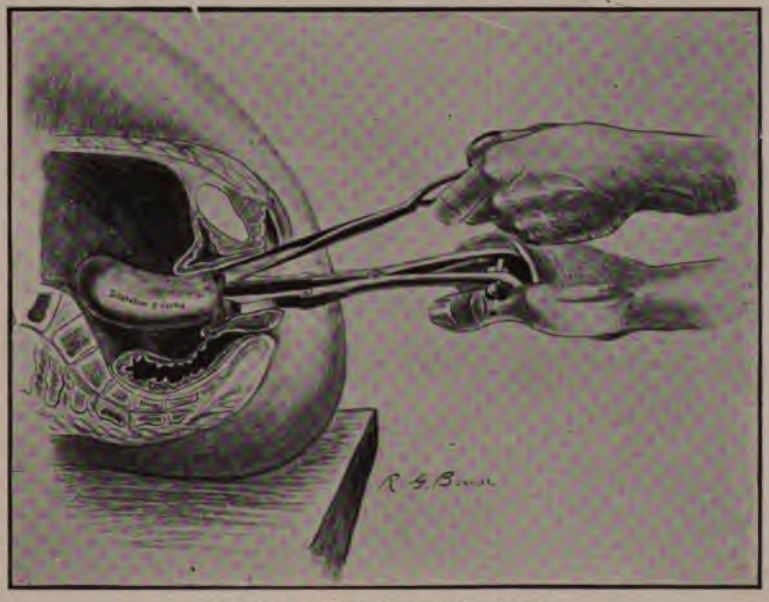


Fig. 184.—Dilatation of the Cervix.

endometrium systematically scraped. A sharp curette should always be used. With an irrigating curette it is not necessary to withdraw the instrument until the work is completed, as the constant stream of water washes out the scrapings. Otherwise, the curette should be frequently withdrawn and the cavity irrigated. There still remains a narrow strip of endometrium across the fundus which the Sims curette—the instrument in common use in this country—cannot dislodge on account of its shape. This can best be reached by the Martin curette, which it would be well to use for this purpose. The Martin curette is also better adapted to cases requiring more force than

ordinary, as in some cases of adenoma, polypoid endometritis, and cancer.

After the curettage, irrigation should be continued for a few minutes. The cervical speculum is now introduced and a strip of sterilized gauze carried through it into the cavity. This may be done either by the use of a long, slender forceps or the uterine sound. The object of this is to absorb the blood and fluids remaining in the uterine cavity. An applicator wrapped with cotton and dipped in carbolic acid (95 per cent.) follows quickly the withdrawal of the gauze, and the cavity is swabbed thoroughly. Lest some of the acid should escape into and burn the vagina, a wad of cotton should be placed back of the cervix in such a position as to receive the discharges from the same. To prevent the cotton of the applicator from becoming dislodged and left in the uterine cavity—an accident which has occurred repeatedly—the instrument should be wrapped for a length of four or five inches so that it may be caught by the fingers if it shows a disposition to slip. The cavity should now be packed with a strip of

Fig. 185.—Irrigating Curette.

iodoform gauze, being careful not to fold it upon itself in the cervical canal and thereby obstruct drainage.

The vagina is now cleaned out and wiped dry, the cervical speculum removed, the traction forceps taken off, the uterus pushed up, the redundant gauze folded loosely in the vagina, the retractor liberated, and the external parts sponged off. The gauze is removed in from two to four days and a vaginal douche given. Excessive pain or fever may demand its removal at any time. The patient should remain in bed about one week.

When there is difficulty in introducing the dilator careful study of the direction of the canal as developed by the sound will be essential to success. A small internal os may sometimes be partially dilated by passing the sound through it and then by pressing first in one direction and then another. This failing, the dilator may be introduced as far as it will go and the canal dilated up to the point of constriction, when it will often be found that the opening has enlarged sufficiently to admit the dilator. A more speedy and satisfactory method is to

have on hand a few of the smaller sizes of graduated dilators to prepare the way for the branched dilator.

Curettage should not be performed in case of diseased and adherent appendages unless it is to be followed immediately by abdominal section. Dragging on these is liable to produce rupture, with the escape of pus into the peritoneal cavity and disastrous consequences. It occasionally happens that the curette passes through the uterine wall into the peritoneal cavity. The accident is signaled by the extraordinary depth to which the instrument will pass upward, and the want of definite resistance. It occurs with the upward movement of the instrument, and seldom, if ever, with the downward sweep of the same. The accident is most liable to occur after abortion or labor at term, when the uterine wall is soft and friable. It may occur under other conditions. This accident has happened to me twice, and on two other occasions it has happened to my assistant in my presence. In neither case was there an appreciable resistance to

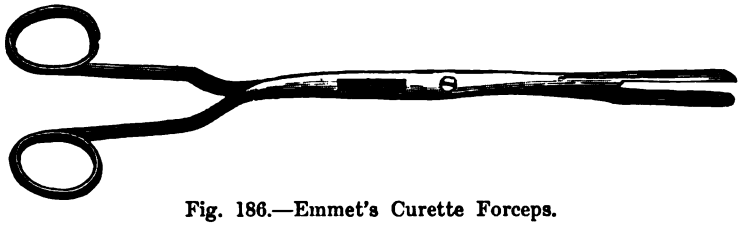


Fig. 186.—Emmet's Curette Forceps.

the curette as it passed through the uterine wall. I have never known evil effects to ensue. On several occasions where I have done abdominal section following curettage I have found blood-stained fluid in the peritoneal cavity which had escaped through the perforated uterus. In the event of such an accident it is better to desist immediately and put the patient to bed. Subsequent irrigation of the uterus is apt to carry fluids into the peritoneal cavity, while the contraction of the uterus following the administration of ergot is of questionable utility, for, while it reduces the size of the rent, it may also cause the contents of the cavity to be expelled through it. Warning symptoms may call for abdominal section.

Evils of Curettage in Streptococcic Infection of the Uterus.—The indiscriminate use of the curette in the infections following miscarriage or labor at term has greatly increased the death-rate, especially in the streptococcic form of infection. It is a question, indeed, if the curette used post-partum has not killed more than it has cured.

Infection after confinement is saprophytic or septic. Saprophytic, or putrid, infection occurs where fetal *débris* has been left in the uterine cavity: fragments of placenta and fetal membranes. In itself, saprophytic infection is not very dangerous to life. As the saprophyte has not the power of proliferation in the living tissues and fluids, it ceases to do harm as soon as the pabulum upon which it feeds is exhausted or expelled from the uterine cavity. Streptococcic infection, which in this instance is the synonym for septic infection, is guarded against by a cell infiltration just beneath the superfical layers of the endometrium, which fences it off from the deeper structures and prevents its dissemination through the lymph- and blood- streams. The result is, if left alone, a stratified, or superficial, endometritis, which soon runs its course to spontaneous cure.

In the limited number of cases, and in the epidemic form a much larger number, the germ is of exceptional virulence. Here it projects its baneful influence before it, and seemingly overawes and paralyzes

Fig. 187.—Cervical Speculum.

defensive effort. The protective leucocyte wall is either not formed or is so imperfect that it quickly succumbs to the advancing bacteria, and they go unhindered to complete their deadly work. Such cases are not amenable to any form of treatment.

The normal mortality of streptococcic infection is about 5 per cent. Streptococcic infection constitutes about 25 per cent. of the post-partum infections, so that it will be seen that the normal death-rate is very small. This is much less than is generally supposed, and is probably below the death-rate from the same cause in former times, but is substantiated by statistics gathered from various sources. The diminished rate of streptococcic infection and the diminished mortality attending it nowadays are largely, if not entirely, due to the strict aseptic *régime* which now prevails in all sections. The germ is not often carried into the genital tract on dirty fingers, or, if introduced, it is usually in a half-starved and enfeebled condition from the absence of filth upon which to subsist. Curettage in streptococcic

infection breaks down the wall of protection, and opens up avenues of invasion to the hordes of bacteria which had been corraled on the surface of the mucosa next to the uterine cavity, where, if undisturbed, perfect drainage and exhausted soil must soon compass their extinction. As the result of this broadcast dissemination of bacteria, now grown strong from rich diet, the death-rate increases prodigiously. Prior places the average at 22 per cent.

Curettage is right and proper in saprophytic infection, though in the majority of cases not absolutely essential. It is pernicious and deadly in streptococcic infection.

It becomes, then, a matter of much importance to distinguish between the two. This can only be done positively by microscopic examination of the lochia, the fluid being collected in the Doederlein tube. This is not always practicable in the less densely populated districts; hence it becomes necessary to depend on the clinical evidences. It may be stated as a rule to which there are few exceptions that

Fig. 188.—Lennicker's Packing Forceps, for Carrying Gauze into the Uterine Cavity.

saprophytic infection is characterized by high temperature, slow pulse, and a foul odor, whereas in streptococcic infection there is no odor in the earlier stages, and the pulse is markedly accelerated according to the virulence of infection. At a later stage there may be foul odor from necrosis of the endometrium. Suppression of the lochia is usually an early symptom. Digital examination of the uterine cavity will also give valuable evidence. In saprophytic infection the uterus contains *débris:* that is, its surface is roughened. In streptococcic infection it is smooth.

It is useless to say that the examination should be made with scrupulous regard to aseptic detail. If the evidences of saprophytic infection be convincing, the cavity should be curetted and flushed. In streptococcic infection flushing only is indicated. In the latter there should be but one flushing, which should be thorough, a gallon of hot, normal salt solution being used. Saprophytic and streptococcic infection may co-exist. In such an event, and in all cases where

doubt exists as to the exact nature of the infection, it will be safer to abstain from curettage.

There is no specific constitutional treatment for streptococcic infection. The antistreptococcic serum treatment, from which much was expected, has proven a failure. The silver treatment is on trial, with much to sustain its claims as a germicide and antitoxin. It has been found that germs will not propagate in the vicinity of silver, and that suppuration seldom occurs in the track of silver sutures. Acting on this suggestion, Credé has formulated a constitutional silver treatment. The preparation used is what is known as collargolum: an allotropic form of pure silver. This is absolutely non-toxic in any quantity, and argyria has never been known to follow its use. It may be used *per os* in pill or solution, by intravenous injection, in solution, or in the form of an ointment applied to an absorbable surface. This latter is the form in which it is habitually used by the originator. Credé's ointment contains 15 per cent. of collargolum.

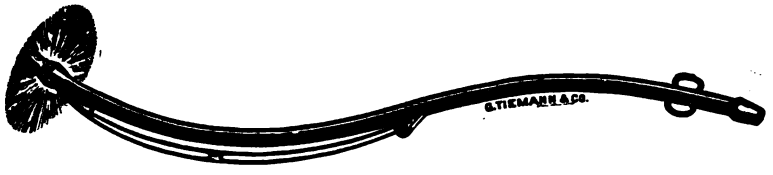


Fig. 189.—Langstaff's Intra-uterine Douche.

The surface to which it is to be applied—the inner surface of the thighs or other portions of the body where the skin is soft and thin—is to be cleansed and softened by the application of soap, water, and brush, and the ointment rubbed in from twenty to thirty minutes, or until it has all disappeared. The quantity used is usually from 15 to 45 grains, but there need be no limit. The applications may be repeated from one to a half-dozen times in the twenty-four hours. The ointment must be protected from the light to prevent deterioration.

ATMOCAUSIS.

Atmocausis, in the sense here used, is the application of superheated steam to the uterine cavity as a therapeutic agent. Its use requires a specially devised apparatus, which consists of a steam generator, and a uterine catheter which is attached to the generator by rubber tubing. The boiler of the generator is supplied with a ther-

mometer to register the temperature, which is to be maintained at a grade of from 212° to 230° F. The catheter is made of hard rubber or other non-conducting material, and provided with numerous small perforations for the escape of steam. The patient is placed in the lithotomy position and the operations conducted through a cylindrical speculum. This speculum, like the catheter, should be of some non-conducting material, such as hard rubber or wood, to protect the vulva and vagina from excess of heat. Both principle and appliance are the contributions of Sneguiriff, of Russia.

Atmocausis has been recommended for a variety of conditions in which hemorrhage and profuse discharge are leading symptoms, as in senile and catarrhal endometritis, hemorrhages incident to subinvolution of the uterus, diffuse myomata, and arteriosclerosis. It is also recommended for the infectious diseases of the endometrium, and more especially the streptococcic and gonorrheal. It is contra-indi-

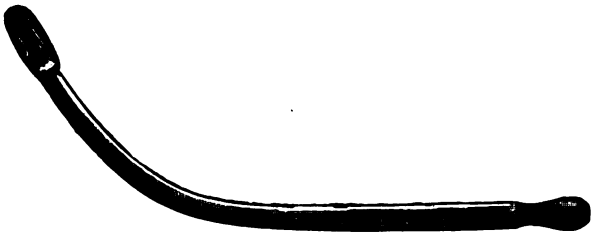


Fig. 190.—Berlin Glass Douche.

cated in inflammatory disease of the appendages and in cervical stenosis. It is a powerful agent for good or evil, and should be used with the utmost care and discretion. Steam heat is very penetrating and destroys tissue both rapidly and to a much greater depth than is usually supposed. The application to the uterine cavity is usually followed by a pronounced irritation of the pelvic environments of the uterus, and might easily lead to serious consequences to the bladder, rectum, or appendages. The woman should be kept in bed for several days.

Too freely used atmocausis is almost habitually followed by adhesive inflammation and obliteration of the uterine cavity and canal, thus converting the uterus into an impermeable sarcous plug. The effect of an artificially produced obliteration of the cavity of a hollow secreting organ would be anticipated with concern, as also the ultimate effect as a factor of serious degenerative changes. Hysterectomy

has been found necessary to relieve the intolerable pains resulting from obliteration of the uterine cavity in the menstruating woman.

As used at present it has a limited range of application, and should be confined largely to the climacteric or post-climacteric period, finding its special province in senile endometritis. As a hemostatic it probably has no equal, and may be used as a *dernier ressort* in any of the conditions above mentioned, if used with judgment and discrimination. It is claimed that an application of three seconds is sufficient to stanch hemorrhage in a uterus of normal size, and that under no consideration should it be prolonged to exceed fifteen or twenty seconds unless with the intent of producing an obliteration of the cavity. Where obliteration is desired the *séance* may be continued from four to eight minutes.

TUBERCULOUS ENDOMETRITIS.

This is sometimes called chronic, diffuse tuberculosis of the endometrium, or corporeal tuberculosis of the uterus. It is quite common, being next in frequency to tuberculosis of the Fallopian tubes. It occurs in about two-thirds of the cases of general tuberculosis. The infection may come from above—the peritoneum and tube by way of the tube; from below by way of the vagina, the infecting medium being the semen, instruments, or fingers; or the bacilli may be wafted on the blood-stream.

Tuberculous endometritis occurs in three forms: miliary, caseous, and fibroid. *The miliary form* has no symptomatology, is seldom suspected, and almost never diagnosed. It starts as a scanty deposit of minute tubercles in the vicinity of the tubal orifice. The deposit is located in the interglandular substance of the endometrium immediately beneath the epithelium. From here it spreads and strikes deeper until it involves the entire mucosa, encroaching on the glands and crowding them out of existence. In advanced cases the endometrium is entirely devoid of glands. With all this destructive change the epithelium is not disturbed, and to the naked eye the endometrium does not differ materially from the normal.

The caseous form is caused by an enlargement, coalescence, and massing of the miliary tubercles, with the usual result of caseation and ulceration. The ulcers are ragged and irregular, with overhanging edges. Both caseation and the resultant ulcers are confined to the mucosa, never being found in the deeper structures of the uterine wall. Beneath this is a stratum of typical tuberculous tissue, while deeper

still the tubercular invasion can be traced into the muscularis along the course of the blood-vessels. This is the form with which we are clinically conversant and from which a diagnosis is most frequently made. The surface indications are conspicuous and the deeper infiltration, which often results in the destruction of the muscle, produces a marked thickening of the uterine wall. The deeper infiltrate preserves its miliary form and does not caseate. The discharge is usually quite abundant, and is watery or turbid. It sometimes becomes purulent from pyogenic germ infection, in which case it is often associated with an inflammatory occlusion at the os internum. This will give rise to pyometra.

The fibroid form is the result of a round-celled infiltration of the miliary tubercle and its surroundings, which later becomes converted into fibrous tissue. Under its influence the essential histologic elements of the uterus—glands and muscle—become jugulated and the walls become firm and fibrous. So far this condition has only been recognized post-mortem.

Symptoms.—The symptoms of tuberculous endometritis are neither characteristic nor, as a rule, conspicuous. In the caseous form there may be a profuse leucorrhea and other indications of endometritis, but these are very much like those of other forms of endometritis. Occasionally caseous particles may be found in the discharges.

Diagnosis.—The diagnosis can usually only be made by examination of the scrapings after curettage. If the histologic structure of the tubercle can be made out or the bacillus found, the diagnosis is clear. Unfortunately for the microscopist, giant cells are sometimes found in the non-tuberculous mucosa, and round-celled infiltration sometimes gives the structural picture of a tubercle. Bacilli are sometimes scant and hard to find, though in the advanced stages they are usually abundant. They are sometimes found in the secretions. When the bacilli cannot be demonstrated microscopically, inoculation of the peritoneum of the guinea-pig with the scrapings will give positive results in from two to four weeks if the bacilli are present. Tuberculous endometritis may be suspected in case of long-standing endometritis or if caseous particles be found in the discharges. Also if the patient be of a phthisical family, if she herself is tuberculous, or if she has a tuberculous husband.

Treatment.—Cases have been cured by thorough curettage and packing with iodoform gauze. Iodoform is peculiarly inimical to the tubercle bacillus. As the tubes are more often than otherwise coin-

cidently affected, and as in many instances they are the source from which the uterine infection was derived, one can never be sure that reinfection may not take place after its dislodgment from the uterus. Complete extirpation of the uterus and appendages is the only absolute safeguard against recurrence, though there are many cases in which one will choose the less radical method with the view of preserving the genital organs intact. Such cases frequently do well.

CHAPTER XXV.

MALIGNANT DISEASES OF THE BODY OF THE UTERUS.

MALIGNANT diseases of the uterus are of two general types: carcinomatous and sarcomatous. The carcinomatous growths are of epithelial origin, developing from the surface or glandular epi-

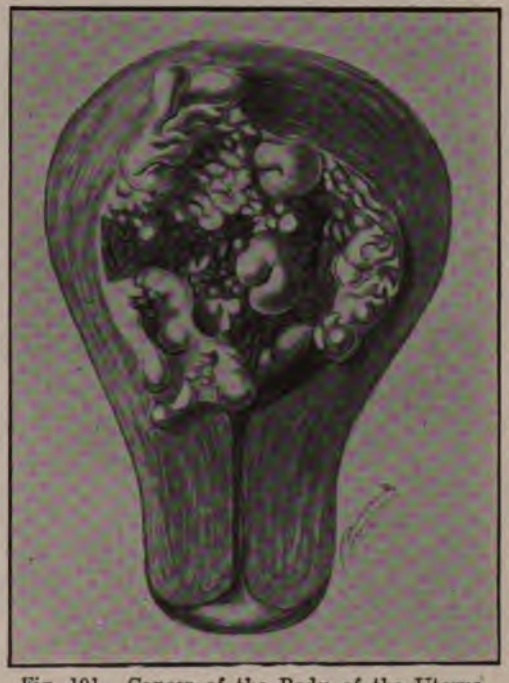


Fig. 191.—Cancer of the Body of the Uterus.

thelium of the mucosa, while the sarcomatous growths originate in connective tissue. Besides the typical carcinoma, a somewhat atypical form is occasionally met with in the uterine cavity called malignant adenoma. These are put in one class. The sarcoma also has a congener in what is called deciduoma malignum. These constitute an-

other class. Malignant adenoma and deciduoma malignum are comparatively recent discoveries, and there is much yet to learn with reference to their clinical history and pathology.

CARCINOMA.

Cancer of the body of the uterus is essentially a disease of advanced life. It occurs most frequently in women who have passed the climacteric. It is also largely confined to the nulliparous woman: the sterile married or old maid. It takes its origin in the utricular

Fig. 192.—Carcinoma of Uterus. (Photomicrograph by Gramm.)

glands, and presents under two forms: polypoid excrescence or as a diffuse infiltration. It rapidly involves the deeper tissues. In most instances the necrotic, superficial layers are washed away in the discharges or are thrown off in the form of shreds or flakes of variable size. In this way the womb becomes hollowed out and converted into a mere shell. Occasionally the dead tissue will fail to disintegrate, and be retained. (Fig. 191.) In such, it accumulates until it finally constitutes almost the entire thickness of the uterine wall. As the disease approaches the serosa adhesions are formed to contiguous organs. Perforations sometimes occur into the bladder, bowel, or

peritoneal cavity. This latter is usually followed by peritonitis and death. The tubes and ovaries are involved and metastases frequent.

Symptoms.—The most prominent symptoms are pain, hemorrhage, and watery discharges. Any or all of these may be absent. Hemorrhage is usually the first symptom to attract attention. It may be intermittent and copious, or more or less constant and dribbling. Occurring, as it does, after the menopause, it is ominous, and should lead to careful inquiry.

Discharge.—The discharge is watery, usually turbid, and oftentimes foul-smelling. It may be destitute of odor. It may be more or less purulent or sero-sanguinolent in character. It often occurs in gushes at intervals.

Pain.—The pain varies greatly in its character, location, and intensity. The lumbar and sacral regions are the most usual sites. It sometimes runs down the thighs. Periodical, paroxysmal pains,

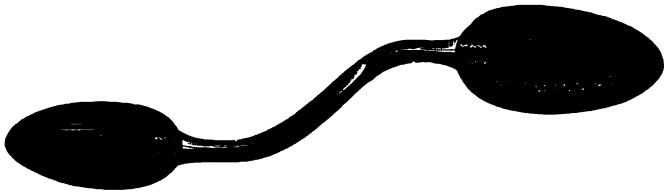


Fig. 193.—Large Cervical Dilators, for Preparing the Way for Digital Exploration of the Uterine Cavity.

recurring at certain hours of the day, are almost pathognomonic, but are not always present. The pain sometimes resembles a uterine colic, —which, indeed, it is,—and is occasioned by the attempt of the uterus to expel its necrotic contents or pent-up secretions. Peritonitic pains also occur in the later stages of the disease. Some cases suffer atrociously, others not at all.

Diagnosis.—In the early stages of the disease there is nothing subjectively upon which to hinge a diagnosis. The uterus is moderately enlarged, smooth, regular in outline, and movable. Later it becomes nodular and fixed. It may become so environed by adherent viscera as to be unrecognizable by palpation. An enlarged uterus in a woman of advanced age would suggest cancer, fibroma, or retention of secretions. Fibroma will usually have a history and the absence of atresia, as demonstrated by the sound, or escaping secretions will exclude retention. The hemorrhage, pain, and discharge are strongly suggestive of malignancy. Nodular masses on the surface of the

uterus and fixation through infiltration of its ligaments and adhesions to adjacent structures in conjunction with the symptoms just named make the diagnosis of cancer almost positive. Unfortunately, a diagnosis at this stage can be of no benefit to the patient. Taking into consideration the age of the patient, and the comparatively recent development of the signs and symptoms, there is small likelihood of confounding cancer of the body of the uterus with anything else. A uterine polypus may give rise to hemorrhage, foul-smelling discharges, and possibly expulsive pain. This, if it does not appear at the orifice, may be found by dilatation of the canal and an exploration of the uterine cavity. In all cases of doubt and at the earliest possible moment, the sharp spoon curette should be used freely and systematically over the entire endometrium and the scrapings submitted to microscopic inspection. The general health of the patient will give no clue until the disease is beyond control.

Treatment.—If the diagnosis is made before the disease has passed beyond the confines of the uterus, as evidenced by its mobility, smooth, regular surface, and absence of rigidity or induration of the ligaments,

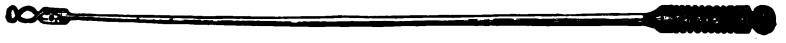


Fig. 194.—Sims's Screw for Removing Tampon.

panhysterectomy by the abdominal route or the combined abdominal and vaginal method is clearly indicated. Early, total extirpation of the uterus for corporeal cancer yields most excellent results, both immediate and remote. Unfortunately, the disease is so insidious in its approaches that comparatively few cases are found in time to secure the best results through radical operative measures.

Medical Treatment.—In the absence of or subsequent to surgical treatment medical treatment may be resorted to. For hemorrhages, hot douches of water or vinegar may be used. These failing, the vagina may be packed with gauze, either plain or saturated with some styptic, such as alum or Monsel's solution. For the discharges and odor douches of some antiseptic or deodorant will be indicated, such as mercuric bichlorid (1 to 4000), 3 to 1000 solution of carbolic acid, 2 to 1000 solution of permanganate of potash, and 1 part to 3 or 4 of peroxid of hydrogen. The external genitals and thighs may be protected from the acrid discharges by repeated washings in Castile soap and water, followed by inunction with benzoated oxid of zinc ointment. For the pain nothing is so efficacious as mor-

phine. Its hypodermic administration is attended with the least unpleasant after-effects and it should be used unsparingly according to the necessities of the case.

ADENOMA MALIGNUM.

Adenoma malignum is a malignant degeneration of the endometrium closely allied to cancer. The growth does not appear as a circumscribed tumorous mass, but as a diffuse thickening of the mucosa. The surface is velvety, uneven, and occasionally villous, and the membrane succulent. The gross and microscopic appearances are so similar to those of glandular hypertrophy as to require special training and actual experience to differentiate them. The disease, while essentially malignant, and if left to itself, unswervingly progresses to a fatal termination, is insidious in its approaches and tardy in its course; so that the patient may survive and retain the semblance of health long after the period allotted to other malignant affections of the uterus.

Symptoms.—The symptoms are slow to manifest and not very characteristic. They are such as are observed in corporeal cancer, but of mitigated severity. The hemorrhage is less profuse, the discharges less abundant, the pain less severe, and the odor less offensive. All the symptoms are subject to abatement, and the period of quiescence may be so protracted as to encourage the hope of a mistaken diagnosis; but the amendment is fictitious, and always culminates in renewed activity and oftentimes increased virulence. The diagnosis lies between malignant adenoma and cancer, and is arrived at principally by exclusion. With many of the symptoms of corporeal cancer the course of the disease and the microscopic findings do not correspond.

Diagnosis.—Exploratory curettage of the uterus reveals no cancerous structure nor *débris*. This in itself will exclude cancer and go far toward establishing the diagnosis of malignant adenoma, as there is no other condition of the uterus that would give the positive indications of cancer with the negative microscopic findings. Unfortunately, the microscopic findings are also very apt to be negative so far as the adenoma is concerned; so that, while cancer may be positively excluded, adenoma cannot be positively verified. The slow progress, the absence of cachexia, and the interrupted course of the disease, taken in connection with the negative evidences as adduced by the microscope, make a chain of circumstantial evidence so strong

as to justify the diagnosis. In case of doubt the patient should be given the benefit of the doubt by regarding and treating the case as one of malignant adenoma.

Treatment.—The treatment is extirpation of the uterus. This when timely employed gives excellent results, there being fewer relapses than from any other form of malignancy affecting the uterus. Curettage and cauterization only aggravate the trouble and precipitate the issue.

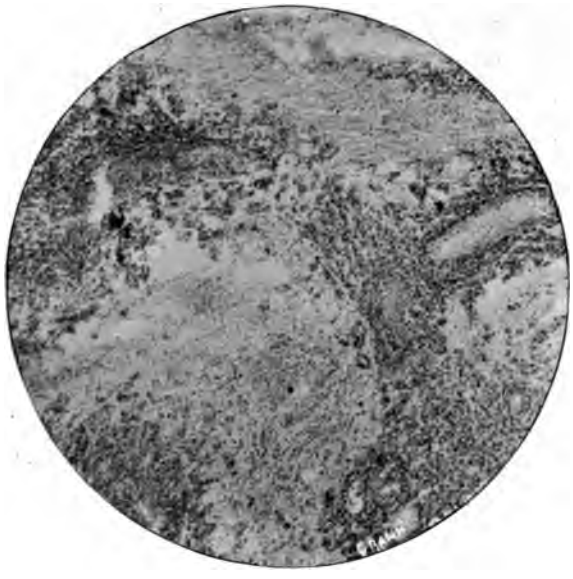


Fig. 195.—Round and Spindle Cell Sarcoma of Uterus Degenerating. (Photomicrograph by Gramm.)

SARCOMA OF THE UTERUS.

Sarcoma of the uterus is, with few exceptions, confined to the body, the cervix seldom being primarily involved. It takes its origin in the interglandular connective tissue of the endometrium or in the connective tissue of the uterine wall. Herein lies the difference between sarcoma and cancer, the former being a connective tissue growth, while the latter is a glandular or epithelial growth. It occurs in two forms: 1. As a diffuse infiltration. 2. In the form of a distinct tumorous mass: the so-called fibrosarcomata.

Diffuse Infiltration is found in the endometrium. It may be confined to circumscribed areas or involve the entire mucosa. It is some-

times polypoid or papillary in character. The latter is soft, vascular, and brain-like. The involved surface is uneven and necrotic. The round-cell variety is most prevalent in this situation. The growth is apt to be rapid and progressive, involving first the uterine walls and thence passing to the contiguous viscera. Extensive adhesions between the uterus, intestines, omentum, and abdominal walls herald the advancing disease.

Fig. 196.—Fibrosarcoma of Uterus Removed by Panhysterectomy. (Author's Case. From Photograph.)

Fibrosarcoma.—The fibrosarcomata develop in the uterine wall. They are distinctly tumorous, and resemble the uterine fibroid. Like the fibroid, they may be subserous, submucous, or interstitial as regards location. They are usually of softer consistence than the uterine fibroid. They are single or multiple and for the most part belong to the spindle-cell variety. (Fig. 196.)

Causes.—The causes of sarcoma are unknown. It occurs at all ages, but is most prevalent in the decade of the menopause. It, like cancer of the body of the uterus, is most frequently found in the nulliparous woman.

Symptoms.—The symptoms are so similar to those of cancer of the body of the uterus as to be indistinguishable. These are pain,

hemorrhage, and discharge. The discharge is watery, purulent, or sero-sanguinolent, and usually offensive. The cervix and its canal are sometimes unchanged, but more frequently the canal is patulous. The growth may protrude from the cervix, either from excess of development or from expulsive efforts of the uterus. The degenerated tissue is soft, friable, and unctuous, and presents the general characters of cancer. Inversion of the uterus sometimes occurs in the progress of the disease. I once did a vaginal hysterectomy in a case

Fig. 197.—Sarcoma of the Body of the Uterus (Inverted). (Author's Case.)

of this kind. The uterus attains a larger size than in cancer and may become voluminous. Metastasis by way of the lymphatics is less frequent than in cancer. Cancer, for the most part, follows the lymph channels, while the sarcomatous elements are wafted on the blood-current.

Diagnosis.—From a practical standpoint, the differential diagnosis between sarcoma and cancer is of little importance. The clinical features and course are substantially the same, as is also the treatment. In fungoid endometritis we have a benign affection which in many

respects presents a puzzling similarity to diffuse sarcoma. Fungoid endometritis, however, seldom occurs after the menopause, is seldom accompanied by a bloody-serous discharge, and is not attended by the pain of sarcoma. The uterus is neither so large nor so tender as in sarcoma. The os is not so widely distended, nor does the hypertrophied mucous membrane protrude through it. The constitutional symptoms are not so marked, and there is an absence of cachexia. The microscope, if properly used, will be of incalculable benefit in determining the presence of sarcoma. It must be remembered, however, that mistakes even with a microscope are by no means unlikely, unless fortified by the proper precautions. Examination of the scrapings and detached portions of the fungoid masses, whether benign or malignant, may even prove misleading, as round-cell infiltration occurs in both. Often the cast-off masses in sarcoma are the undermined healthy tissues, and would give no sign of malignancy under the microscope. To obviate error, therefore, it is expedient to procure and examine a number of different specimens from different parts of the uterine cavity.

Treatment.—In the earlier stages, and before the involvement of extra-uterine structures, total extirpation of the uterus and its appendages offers reasonable assurance of permanent cure. The abdominal route should be chosen. When the disease has advanced beyond the confines of the uterus, suffering may be alleviated by curettage and cauterization, and such other palliative measures as have been recommended under the head of "Cancer."

DECIDUOMA MALIGNUM.

Deciduoma malignum—otherwise known as syncytioma malignum, chorio-epithelioma malignum, and by various other aliases—is a most interesting disease of recent discovery. It belongs to the sarcomatous type, is intensely malignant, and usually runs a rapid course to a fatal termination. As the name implies, it is a malignant affection of the decidua, and is found occupying the uterine cavity after labor, abortion, or after the expulsion of a fetal mole. It takes its origin in the syncytium, or that layer of the placenta which occupies the border-line between the fetal and maternal portions. Authorities differ as to which it belongs. It occurs in the form of small, soft, roundish tumors, which bleed spontaneously or on very slight provocation. The tumors are atypical representatives of placental tissue, and, like that, present clefts which are filled with blood.

The rich vascularity of the adjacent tissues and the tendency of the disease to invade the blood-vessels insure an early distribution of the sarcomatous elements. Metastases are consequently early and widespread.

Causes.—The causes of deciduoma malignum are not known. Its association with fetal moles is so frequent as to constrain to the belief that there is a causal relation between them; that they both arise from the same cause, with modifications adapted to each. In a series of fifteen cases reported by Marchand 80 per cent. were preceded by hydatid formations in the uterus. In 177 cases collected by Pierce he finds the disease preceded by hydatid mole in 77 cases, normal labor in 30 cases, and abortion in 20 cases.

Symptoms and Diagnosis.—The symptoms are only characteristic when taken in connection with a recent delivery or expulsion of a mole. They are intermittent hemorrhage, usually severe, followed later by an offensive, turbid, watery discharge. Blood-clots are expelled at intervals with painful contractions of the uterus. Loss of flesh and strength, anemia, and cachexia are early manifestations. The uterus is enlarged and boggy; the cervix usually, though not always, patulous; and the uterine cavity filled with vegetations. These latter are often concealed by coagulated blood, and may be mistaken for blood-clots after removal. The uterine walls are soft and friable and easily perforated. The early occurrence of metastases is significant. A correct diagnosis may be quickly attained by microscopic examination of the vegetations removed by the finger or curette.

Treatment.—Early and complete removal of the uterus and appendages offers the only hope of relief. After the establishment of metastatic deposits nothing will be gained by operative interference, and none should be attempted.

CHAPTER XXVI.

FIBROID TUMORS OF THE UTERUS.

THE uterine fibroid takes its origin in the walls of the uterus. It is a benign growth, and is composed of the same histologic elements that constitute the muscular walls of the uterus: connective tissue

Fig. 198.—Uterine Fibroma. (Photomicrograph by Gramm.)

and unstriped muscle-fibers. Notwithstanding this, it is an independent growth, neither being derived from, nor having any physiologic connection with, normal uterine structure. It is probably congenital in a nuclear form, and may or may not develop in after-life. The connective and muscle- tissues of which the uterine fibroid is composed vary in their relative proportions. As a rule, the connective tissue largely predominates. Rarely the muscle-tissue is in excess. When the tumor consists almost exclusively of muscle-tissue, it is

by some denominated a myoma. Such tumors are exceedingly rare. Properly speaking, all such growths as those under consideration are fibromyomata or myofibromata according as the connective or muscle-tissues predominate.

The term fibroid is used in a general sense, and includes all forms. The color and consistence of the tumor depend largely on the relative proportions of its constituents. Those composed largely of fibrous or connective tissue are dense and hard and of a whitish aspect. The tumor is soft and red in proportion to the amount of muscle-tissue

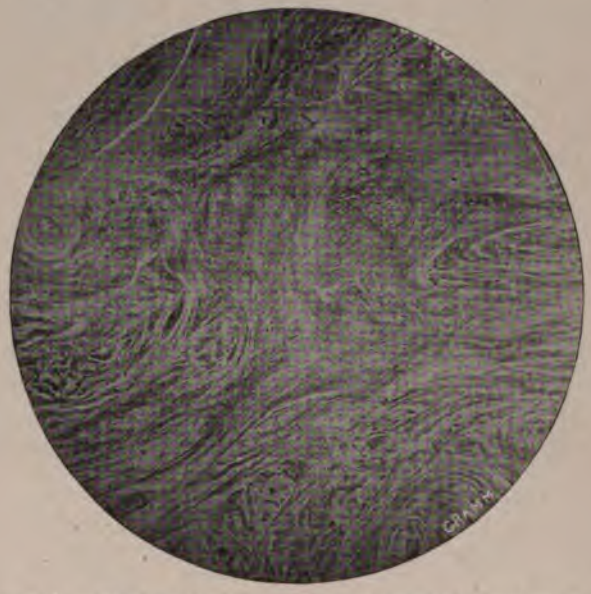


Fig. 199.—Uterine Myoma. (Photomicrograph by Gramm.)

it contains. The hard fibroid cuts like gristle, and the cut surface shows the striations of fibrous tissue. These are variously disposed, being often arranged in concentric rings around different focal points. The cut surface bulges and becomes convex. The fibroid tumor makes for itself a capsule by crowding back the surrounding connective tissue as it grows. The density and thickness of this capsule within prescribed limits is proportional to the size of the growth. The tumor is loosely connected with its environments, which greatly facilitates its enucleation. This also accounts for its change of position under muscular contraction. In this way a tumor situated in the depth of the

uterine wall is sometimes forced toward the cavity or periphery of the organ. The tumor is meagerly vascular, the vessels usually being of small size and few in number. They are derived from the capsule, which is usually richly supplied with blood-vessels.

Causes.—The primal cause of the uterine fibroid is unknown. By some it is supposed to be derived from a little cluster of left-over cells which were not utilized in the formative process of the uterus. It is probable, at least, that the nucleus of the growth exists before birth. It usually develops during the active, sexual period of the woman's life: between the ages of thirty and forty. It occurs with greater fre-

Fig. 200.—Positions of the Subserous, Interstitial, and Submucous Fibroids.

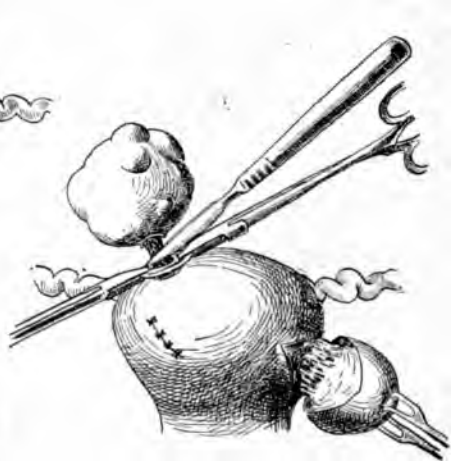


Fig. 201.—Method of Removing Pedunculated Subserous Fibroid by Turning Down a Cuff of the Peritoneum.

quency in the unmarried and sterile. This is supposed to be due to the regularly recurring menstruation, with its attendant congestion, which conduces to the nourishment of the growth. On the other hand, the involutionary changes that take place after childbirth may cause the disappearance of the smaller fibroids before they have attained to such size as to attract attention. Even large tumors have been known to disappear after childbirth. The fibroid tumor, while, in a measure, dependent on sterility, is also conducive to sterility by the changes it produces in the uterus and appendages, and the hemorrhages and discharges incident to the growth.

Designation According to Position.—Fibroid tumors of the uterus are designated according to the position which they occupy. A fibroid tumor imbedded in the muscular walls of the uterus is called an interstitial fibroid. It is probable that most, if not all, uterine fibroids are originally interstitial. When a fibroid is situated immediately beneath the serous covering of the uterus, it is called a subserous fibroid. These grow outward toward the peritoneal cavity. A fibroid presenting immediately under the mucosa is called a submucous fibroid. These grow inward toward the uterine cavity. (Fig. 200.) Besides these there are other distinctions according to locality. The intraligamentous fibroid is one that pushes out between the folds of the broad ligament. These usually arise from the side of the lower segment of the uterus or from the supravaginal portion of the cervix. A retroperitoneal fibroid is one that pushes up back of the peritoneum, separating it from the structures to which it is attached in the posterior plane of the body. Fibroids developing in front of the peritoneum and between it and the anterior abdominal wall are sometimes designated properitoneal fibroids.

The Submucous Fibroid grows toward the uterine cavity, carrying the mucosa before it. It is usually sessile, but occasionally it pushes bodily into the cavity and becomes pedunculated. It then constitutes the fibroid polypus, described elsewhere.

The Subserous Fibroid develops in the direction of the periphery of the organ, and forms a projecting tumor under the serous covering. It sometimes becomes pedunculated. The pedicle may be thick, dense, and fibrous, or consist of little more than the peritoneum and nutrient vessels. The subserous fibroid, by reason of its density, irregularity, and movements, is very apt to produce irritation of the peritoneum, resulting in effusion. The ascites, however, is seldom pronounced, and is not comparable to that resulting from malignant growth. Another expression of the irritating effects of the subserous fibroid is found in the adhesions between the tumor and the structures with which it comes in contact. Thus we frequently find the tumor adherent to the omentum, bowel, and abdominal wall. The adhesions are sometimes very extensive and vascular, the vascularity contributing largely to the sustenance of the tumor. The pedunculated tumor sometimes becomes detached from the uterus through violence or from progressive atrophy of the pedicle. In such cases the tumor either rolls around loosely in the peritoneal cavity, or else—if adherent—it is sustained and nourished by the structures to which it is attached.

The Intraligamentous Fibroid.—In this the tumor springs from the side of the uterus and that portion of the cervix above the vaginal vault, and pushes out between the folds of the broad ligament. In this position it lifts or pushes the uterus from its natural position, and displaces to a greater or lesser extent all the pelvic viscera. The ureter is habitually displaced, and is sometimes carried far out of line and in the most varied directions, so that its position with reference to the tumor can never be predicated. These tumors are often im-

Fig. 202.—Large Spherical, Cervical Fibroid (Intraligamentous), Removed by Panhysterectomy. (Author's Case. From Photograph.)

pacted in the pelvis, and exert most damaging pressure on the pelvic organs, vessels, and nerves. When they grow upward into the abdominal cavity, they carry the pelvic structures before them. Another form of extraperitoneal fibroid takes its origin in the supravaginal cervix anteriorly, and pushes out between the uterus and bladder. This, in its upward development, carries the bladder with it, sometimes even to the umbilicus. The bladder thus displaced is immediately under the usual line of incision for abdominal section, and may be seriously injured by the operator. When the tumor springs from

the posterior aspect of the cervix it becomes retroperitoneal by passing under the Douglas *cul-de-sac* and making its way up back of the peritoneum.

Degenerative Changes.—The uterine fibroid is subject to a number of degenerative processes, the most common of these being cystic, myxomatous, calcareous, fatty, and malignant.

Cystic Degeneration is due to an accumulation of lymph within the intermuscular lymph-spaces (lymphangiectasis) or to the ulterior changes produced by a myxomatous degeneration. These result in the so-called fibrocystic tumor.

Myxomatous Degeneration results in the formation of a mucus-like fluid in various parts of the tumor, imparting to it a more or less cystic character. As a cause of the fibrocystic tumor it is less frequent than lymphangiectasis.

Fatty Degeneration is most apt to occur after parturition. It may occur after the menopause or under other conditions. It is supposed to be a necessary forerunner to absorption of the tumor.

Calcareous Degeneration of the tumor consists in infiltration with lime salts. It indicates a sluggish movement of the nutrient fluids in the substance of the tumor whereby the volatile acid which holds the lime in solution escapes, allowing the latter to be deposited. The tumor, in consequence, becomes hard and stony. In advanced cases the tumor ceases to have any connection with the surrounding tissues, and, if encapsulated, becomes as a pea in a pod. Myxomatous, fatty, and calcareous degenerations are very rare.

Malignant Degeneration of the uterine fibroid is by no means common, and is almost without exception sarcomatous. Cancer of the endometrium or of the cervix is associated with uterine fibroid with sufficient frequency as to justify the belief that the fibroid in some way predisposes to the cancerous degeneration.

Edematous Fibroid.—The succulent or edematous fibroid is quite common. It is characterized by a watery infiltration, which may be localized or general. It is usually associated with rapid growth and most frequently found in young subjects.

Inflammation, Suppuration, and Gangrene are occasional incidents in the course of the uterine fibroid. These usually arise from infection either through the uterine canal or intestines. A pedunculated fibroid may become gangrenous from torsion of its pedicle, whereby the blood-supply is cut off. A gangrenous submucous fibroid may slough away, and result in spontaneous cure, but the process is a dangerous one, and is attended with a high rate of mortality.

Growth of the Fibroid.—The growth of the fibroid is erratic. Unlike the ovarian cystoma, which is regularly progressive to a fatal termination, it is impossible to predicate the course of the uterine fibroid in any given case. It often attains a moderate size and remains quiescent, or it may at any stage undergo retrogressive changes. It may develop regularly or spasmodically, slowly or rapidly. It may assume such proportions or inaugurate such conditions as to demand operative interference, or it may run its course and finally subside without artificial aid. Enormous development of the uterine fibroid is occasionally met with. Tumors weighing two hundred pounds have been reported. In the year 1891 I removed one which filled a foot-bath tub. This was disposed of without being weighed. In most instances the growth subsides after the menopause. The menopause is, however, retarded by the presence of the neoplasm, and there is no absolute certainty that this epoch will bring the hoped-for relief. As a rule, uterine fibroids are of slow growth and self-limited. Their period of activity corresponds to the period of active sexual life.

Changes in the Uterus and Adnexa.—The uterus becomes enlarged and its walls hypertrophied. Endometritis usually exists in the hypertrophic variety; occasionally it is atrophic. The tubes are also affected to a greater or less extent, and may present any of the phases of salpingitis from the simple catarrhal form to the pyosalpinx. They are often greatly thickened and elongated, and sometimes much distorted. The ovaries may be inflamed, elongated, or spread out over the face of the tumor. All the vessels leading to the uterus are augmented in size. The size and number of vessels will depend upon the activity of the growth. Changes in the uterus are much less marked with the pedunculated, subserous fibroid than with the interstitial or submucous. Degenerative changes of the liver, heart, and kidneys have been ascribed to uterine fibroid. Compensatory hypertrophy of the heart is also found in connection with the larger growths. Pressure upon the emunctories and disturbance of the circulation are the principal causes of these remote effects.

Symptoms.—The symptoms of the uterine fibroid are local and general. The symptoms depend largely on the situation of the growth. The pressure symptoms are much more pronounced in the subserous and intraligamentous, and hemorrhage in the interstitial and submucous forms. Some growths even of large size are attended by no symptoms. The local symptoms are pain, hemorrhage, and pressure.

Pain.—Localized pain in the uterus is due to one of two causes: tension of the uterine fibers from an interstitial growth, or from the

efforts of the uterus to expel the growth, which acts as a foreign body. The first is steady and continuous; the latter, paroxysmal. Pressure on the adjacent organs—such as the bladder, ureter, and intestine—also evokes pain, which may be referred to the organ encroached upon or reflected in various directions. When the tumor has escaped from the pelvis into the more roomy abdominal cavity, these pains often subside or are greatly mitigated.

Hemorrhage.—The first evidences of hemorrhage begin at the regular menstrual period, and are manifested by an increased flow and subsequently by a prolongation of the period. Eventually intermenstrual hemorrhages occur and menstruation becomes irregular. A very profuse bleeding, either at or in the intervals of menstruation, is apt to be followed by amenorrhea, which may extend over weeks or months. Instead of the torrential hemorrhage, which occurs with such alarming suddenness and severity, there may be a continual dribbling, which gradually exhausts the vital fluid and energies of the patient. A leucorrheal discharge of a simple, sanious, or purulent character frequently alternates with the hemorrhage, and saps the patient's vitality. Hemorrhage is most often found in connection with the submucous or interstitial growths, but may occur in the subserous or intraligamentous varieties, especially if located in the line of the emergent vessels.

Pressure Symptoms.—Pressure on the rectum interferes with the action of the bowels, produces mechanical constipation, and, by interfering with the circulation, gives rise to piles. Painful and difficult defecation and proctitis may result. Pressure on the urethra produces dysuria, sometimes retention of urine, and cystitis. Pressure on the ureters obstructs these passages, and may lead to nephrodrosis and degeneration of the kidneys. Pressure on the large venous trunks coming from the extremities gives rise to a compensatory enlargement of the superficial abdominal veins and edema of the extremities.

General Symptoms.—These occur from the loss of blood, the derangement of function of important organs, and the accumulation of toxins. When the bleeding is profuse or continuous the patient becomes anemic to an extreme degree. Sudden, profuse hemorrhage may even result fatally; but such cases must be exceedingly rare. Many patients are not notably emaciated, but, on the other hand, may be fat, flabby, and pallid.

Diagnosis.—In general terms it may be said that the uterine fibroid is characterized by firmness and insensibility. The uterus is enlarged and the canal elongated, as demonstrated by the sound. The

tumor is in intimate connection with the uterus, and may be determined by rectal and vaginal touch, assisted by the hand on the abdomen, as also by concerted movements of the tumor and cervix, any motion imparted to one being communicated to the other. Pain, hemorrhage, and pressure symptoms should be given consideration.

Before resorting to the sound *pregnancy* should be excluded. A softened cervix, a boggy uterus, and amenorrhea should always raise the question of *pregnancy*, and lead to a careful inquiry into all the conditions whereby pregnancy may be affirmed or excluded.

Fig. 203.—Interstitial and Multinodular Fibroids partially Intraligamentous, Involving Body and Cervix. Removed by Panhysterectomy. (Author's Case. From Photograph.)

Ectopic gestation has been repeatedly mistaken for uterine fibroid. The rapid growth, the tenderness and bogginess of the mass, the colicky pains, faintness, and shreddy discharges will usually suffice to differentiate this from uterine fibroid.

The *dermoid cyst* may be hard and resistant, and hug the womb so closely as to be practically inseparable from it. The dermoid is usually tender. Other cysts, especially the papillomatous or multilocular ovarian cyst, may so closely resemble the uterine fibroid in touch as to be indistinguishable from it. In all such cases the absence of concerted movements, and the evidences acquired by rectal indaga-

tion, and especially the depth of the uterine canal, as determined by the uterine sound, will greatly aid in the diagnosis.

The *edematous fibroid* and the *fibrocystic tumor* of the uterus are often most difficult to distinguish from the multilocular cyst. The rectal touch and the uterine sound are here often indispensable to a diagnosis. It must be remembered that in certain pedunculated, subserous fibroids the uterus is not enlarged nor its canal elongated.

The special diagnostic criteria, according to the situation of the growth, are as follows:—

Interstitial Fibroids.—In the earlier stages, and before there is marked projection of the tumor toward the uterine cavity or the

Fig. 204.—Fibroid Polypus of the Fundus being Cut Away.

Fig. 205.—Large Submucous Fibroid Protruding through Os.

periphery of the organ, the moderate enlargement, the pain, and hemorrhage are quite indistinguishable from that of corporeal cancer. Here the only sure criterion lies in the microscopic examination of the scrapings of the endometrium. Later the size of the growth, its projection toward the surface or cavity, and its duration will afford clues by which the differentiation can usually be made with comparative ease.

Submucous Fibroids.—The most characteristic symptoms are hemorrhage and expulsive pains. The uterus is enlarged and the canal elongated. If the cervical canal be patulous, a finger may be introduced and—assisted by counter-pressure from above—the cavity explored. Should the cervical canal not be open, dilatation, either rapid

or gradual, may be resorted to. Incision of the cervix bilaterally will greatly facilitate this step of the procedure. Vulliete's method of gradual dilatation by daily packing the uterine cavity with iodoform gauze and increasing the quantity at each packing is both efficacious and free from danger, but has the disadvantage of being slow. With the finger in the uterine cavity, the position, size, and other characters of the tumor may be definitely determined.

Subserous Fibroids.—These are usually multinodular, and may be distinguished by their firmness and attachment to the uterus. The

Fig. 206.—Multinodular Uterine Fibroid. (Author's Case. From Photograph.)

pedunculated variety may sometimes give trouble, but careful manipulation will usually demonstrate their connection with the uterus by the motion communicated to it by pulling or pushing the tumor in different directions. By rectal examination conjoined with manipulation of the growth, the pedicle may frequently be detected and its attachment to the uterus verified. A subserous fibroid attached to the posterior surface of the uterus will sometimes simulate a retroflexion. (Fig. 207.)

The Intraligamentous Retroperitoneal and Properitoneal Fibroids occasionally present insurmountable difficulties in the way of diag-

nosis, but in most instances the nature and location of the growth may be made out by the application of the rules already laid down.

FIBROID POLYPI.

Fibroid polypi may spring from the cervix or uterine cavity. They are much less frequent than the glandular polypi, and, unlike them, are usually single. The length of the pedicle varies, being sometimes short and thick, at others slender and elongated. (Fig. 204.) They are often inflamed and ulcerated, and give rise to a more

Fig. 207.—A Subserous Fibroid Simulating Retroflexion of the Uterus.

or less copious purulent, foul-smelling discharge. Their resemblance to malignant growth is occasionally very close. Endocervicitis and endometritis are also constant accompaniments. The cervical canal is usually dilated, especially in the uterine form. Interference with the blood-supply may cause the pedicle to slough, thus resulting in a spontaneous cure. A fibroid polypus is probably a submucous fibroid which has become pedunculated. Calcareous degeneration will occasionally convert the polypus into a mass of stony hardness. When such are detached and expelled, they constitute the so-called womb-stones.

Symptoms.—The more common symptoms are profuse, purulent discharge; bleeding; and colicky, or expulsive, pains. The bleeding may occur in the form of a more or less constant dribbling or as severe floodings at irregular intervals. Menstruation is usually increased. The pains are paroxysmal and sometimes violent. Backache and a sense of weight in the pelvis are frequent symptoms.

CHAPTER XXVII.

TREATMENT OF FIBROID TUMORS OF THE UTERUS.

THE treatment of uterine fibroids is medical, electrical, and operative.

Medical Treatment.—Before the advent of modern abdominal surgery medical treatment had full sway, and the number and variety of medicinal preparations used was very great. One after another of these was brought to the notice of the profession and faithfully tried. It is a matter of history that none has stood the test of experience as a curative agent. It must be remembered that the natural course of the uterine fibroid is erratic; that it sometimes ceases to grow, may undergo retrograde change, or even disappear spontaneously. A medicine exhibited at this time will get the credit for the favorable result, and thus be invested with virtues which it does not possess.

About the only remedy which has stood the test of time and experience as a palliative, with now and then more permanent results, is ergot. This acts by producing muscular contraction of the uterus and by diminishing the caliber of the smaller blood-vessels. In this way the nutrition of the tumor is diminished, and the hemorrhages incident to its presence are checked or appreciably lessened. The muscular contractions force the interstitial tumor toward the cavity or periphery of the organ, and in the submucous fibroid occasionally cause its expulsion. The drug may be given by the mouth or hypodermically. Used too freely by the mouth, it is apt to provoke gastro-intestinal disturbances. Hypodermically it is at times severely painful. Its excessive use produces great depression of the heart. A pure, unirritating, and reliable preparation should be used. Squibb's aqueous extract of ergot fulfills these indications. For hypodermic use this should be combined with water, 1 part to 10. A little salicylic acid—2 grains to the ounce—will act as a preservative, although it is better to prepare it fresh on each occasion. The dose should be 1 grain a day, gradually increased according to the tolerance of the patient. Both medicine and syringe should be sterilized and the skin surrounding the point of injection thoroughly cleansed. The injec-

tion should be in the muscular tissue of the abdomen in the vicinity of the tumor. The same preparation may be given in pill form by the mouth: 1 grain thrice daily, combined with nux vomica to modify its action on the heart. An additional hypodermic injection, once or twice a week, will usually be about as much as the patient can tolerate over an extended period of time.

Thyroid extract has recently come into favor, both as a hemostatic and reducing agent. It is given in 5-grain doses, three times daily, and may be increased if well tolerated. It is badly borne by some patients, and is contra-indicated in exophthalmic goiter and irritable heart. My own experience with the drug has not been such as to inspire confidence. Other remedies sometimes used are hydrastis Canadensis, extract of hamamelis, and the salts of ammonia and potash. It may be said in conclusion that the treatment is largely symptomatic, and intended for the alleviation of pain or the arrest of hemorrhage. In these it finds its greatest value.

Electrical Treatment.—While there can be little doubt that electrical treatment in skilled hands may be of benefit in certain varieties of uterine fibroid and under certain conditions, its use is so technical and the contra-indications for its use so numerous, and, withal, the results so problematic, as to practically bar it from general adoption. It is not to be used in hysterical women, in the presence of inflammation of the appendages, in malignant degeneration, in fibrocystic growths, or in heart or kidney trouble, and is of little avail in the pedunculated submucous or subserous tumors or in very hard tumors in any situation. It is not fair, however, to scout the agent out of existence; yet the treatment of properly selected cases should be relegated to men who have proven themselves masters of the technique.

Operative Treatment.—The surgical treatment of uterine fibroids may be palliative or radical. The palliative treatment consists in curettage for the control of hemorrhage. It is inefficient because of the irregular contour of the uterine cavity, and dangerous from the liability to sepsis and from possible sloughing of the growth through injury to its capsule. Removal of the uterine appendages, as advised by Tait, and ligation of the uterine and ovarian vessels, as advocated by Martin, are, for the most part, temporary expedients, and scarcely justifiable in the face of accumulated experiences. It has been found that the radical operation of hysterectomy is made much more difficult after such operations, principally because of the collateral circulation, which greatly multiplies the number of vascular points

requiring ligature, and because of their inconvenient location: over the bladder and in the recto-uterine space. The cicatricial tissue also offers serious obstacles to the dissection. The radical operation consists in the extirpation of the growth. This may be accomplished by one of two routes: through the vagina or by abdominal section. In many instances the uterus is removed along with the growth.

VAGINAL OPERATION.—The vaginal operation is limited to tumors of small size. It is seldom practiced in tumors larger than the fetal head. For very small tumors vaginal hysterectomy may be performed. As a rule, this operation is confined to the enucleation of tumors of moderate size which project into or abut upon the uterine cavity: submucous and interstitial.

Enucleation.—Careful aseptic detail should attend every step of the operation. Operation by stages, such as the preliminary dilatation of the cervix, and incision of the capsule, leaving the growth

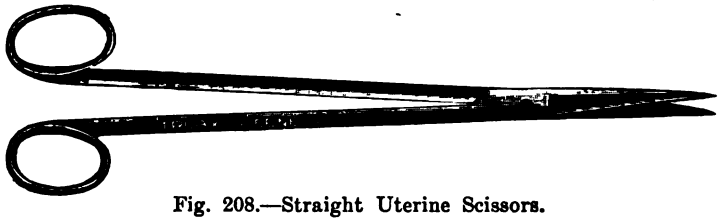


Fig. 208.—Straight Uterine Scissors.

to be expelled by uterine contraction, is tedious, uncertain, and too often complicated with sepsis to merit approval. Cases should be selected that offer reasonable assurance of being completed at one sitting.

The woman is placed in the lithotomy position, and the cervix dilated and, if necessary, split bilaterally to the vaginal vault. The incision may be even carried above the os internum on the inner aspect, providing it is not carried entirely through the cervix at its upper segment. Previous ligation of the uterine arteries will render this part of the operation comparatively bloodless. The capsule is now seized with bullet forceps and split longitudinally from above downward. Seizing the edges of the capsule with forceps, it is pushed back from the face of the tumor by means of blunt, curved scissors or an enucleator. The redundant portion of the capsule is then cut away, the tumor seized with strong-toothed forceps, and the enucleation continued while continuous traction is made on the growth. The end of the enucleator should hug the tumor closely all the while, to pre-

vent perforation of the uterine wall. Occasionally it will be necessary to cut through tough, unyielding bands. When the tumor is in great part separated, it may be wrenched from its bed or rolled out by aid of the forceps. Should it be too large to be delivered through the cervix, it may be split or whittled down to the requisite size. The ragged edges of the capsule should then be trimmed away. Digital exploration of the cavity should be made to determine the nature and extent of any injury to the uterine wall, and if no perforation exist the cavity should be irrigated, dried, and packed with iodoform gauze, reinforced by a loose vaginal tampon. If perforation has occurred, the cavity should be wiped and packed and ergot ad-

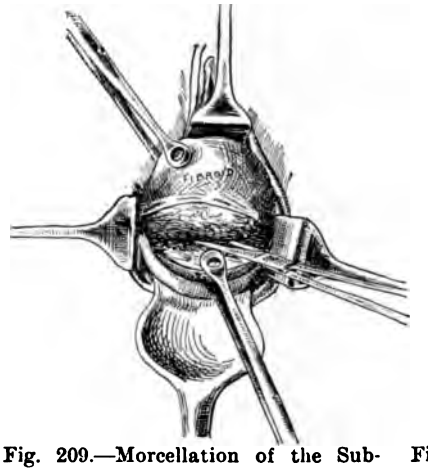


Fig. 209.—Morcellation of the Submucous Fibroid to Reduce its Volume and Facilitate Delivery.

Fig. 210.—The Remnant of the Fibroid Leaving its Bed under Traction.

ministered. The packing should be removed on the third day, and, after irrigation, renewed.

Morcellation.—Sometimes the tumor can be more easily removed by cutting it away piecemeal. (Fig. 209.) Here, under sustained traction, one portion after another of the tumor is excised until the volume is considerably reduced. At some stage of this procedure the tumor suddenly leaves its bed and rolls out into the vagina. (Fig. 210.) This is, in part, due to the continual traction, and, in part, to the uterine contractions, which are rendered more effectual through the reduction of the volume of the tumor. In morcellation (piecemeal excision) firm hold should be taken on some other part of the tumor before that which is in the bite of the forceps is excised. This is to

prevent the tumor from receding. The after-treatment is the same as in enucleation.

Abdominal Operations.—These are comprised under the heads of myomectomy and hysterectomy. These operations presuppose an abdominal section at the usual site.

MYOMECTOMY.—Myomectomy consists in removing the growth from the uterus. This is accomplished by excision or enucleation. It is applicable to cases in which the tumors are neither too large nor too numerous, and, for the most part, is confined to tumors that are located on the anterior or posterior aspect of the uterus and away from the large vessels at the sides. If the tumor be pedunculated, it is seized and steadied while an incision is made around the pedicle or lower segment of the tumor adjacent to the pedicle. The investing capsule is then pushed downward like a cuff, while traction is made

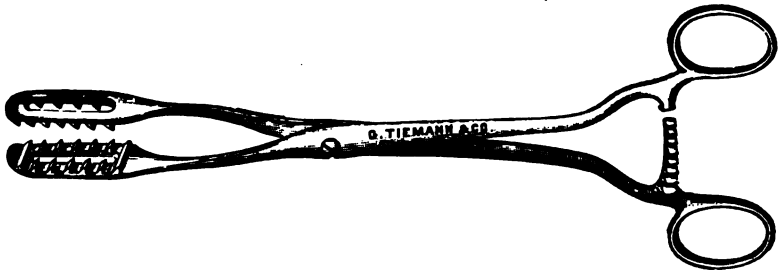


Fig. 211.—Morcellation Forceps.

on the tumor until the growth is separated. (Fig. 201.) The wound is closed by continous catgut suture, which may or may not be serried, according to its depth. In sessile tumors and those imbedded in the uterine wall, an incision is made over the most prominent part of the tumor, and the tumor enucleated by dry dissection. This incision should always, when possible, be made in the long axis of the womb, to avoid cutting across vessels. Occasionally adjacent tumors may be removed from the same opening with less mutilation than if a separate incision were made for each.

It is desirable to avoid entering the uterine cavity, especially when there is reason to suspect infection of the same, as evidenced by foul or purulent discharge. Under ordinary conditions the uterine cavity is sterile; but such is not always the case in the presence of a uterine fibroid. Still, the cavity has been invaded repeatedly in the operation of myomectomy without untoward results. As a precautionary measure the abdominal viscera should be thoroughly pro-

tected by padding. When several tumors are to be removed, the cavities of those enucleated are packed with gauze until the enucleations are completed. Large vessels are caught in pressure forceps or tied at once. The incisions are carefully closed, the mattress stitch being used to include troublesome vessels. The wounds should be carefully inspected for indications of hemorrhage before the abdomen is closed.

Supravaginal Hysterectomy.—The extraperitoneal treatment of the stump in supravaginal hysterectomy, by including it in the lower angle of the abdominal incision, is practically obsolete, and should be relegated to the limbo of the past. It possesses no advantages over the more modern methods, and is clearly inapplicable to

Fig. 212.—Arterial Supply of the Genital Tract.

cases in which the tumor pushes out into the broad ligament or dips under the peritoneum. It is inappropriate in case of short vagina, as in many virgins, and difficult in the presence of cervical tumors. It entails long suffering and confinement; it is frequently followed by hernia, and occasionally by fistula of the cervical canal.

The Baer Method.—The essential features of the Baer method of supravaginal amputation of the uterus consists in ligating the vessels before their entrance into the uterus. The principal vessels requiring ligature are the ovarian and uterine. This operation, with slight modification of technique, has largely supplanted all others.

The preliminary abdominal incision, which is made at the usual site, should be free and ample, that the subsequent steps of the operation may be unhampered. The patient is then placed in the Tren-

delenburg position (Plate XIII), and a careful inspection made of the uterus and its environments. If possible, the uterus may be lifted out through the abdominal incision, otherwise the operation may be

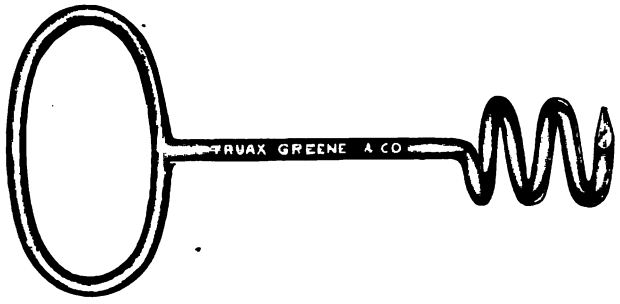


Fig. 213.—Doyen's Myoma Screw, for Lifting Uterus out of the Cavity.

conducted with the uterus *in situ*. The intestines are walled off by gauze pads, and pads are carefully disposed back of and around the

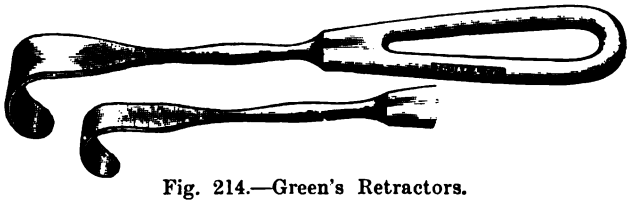


Fig. 214.—Green's Retractors.

uterus to receive the discharges and prevent infection of the peritoneum. Retractors for holding open the abdominal incision greatly facilitate the steps of the operation, by aiding sight and manipulation. A broad

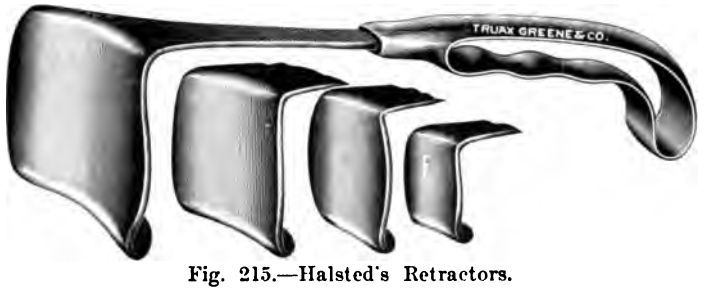


Fig. 215.—Halsted's Retractors.

retractor at the lower angle of the wound, which may be inclined to one side or the other, as occasion may require, is most serviceable. A gauze pad should be placed between the retractor and the edge of the

PLATE XIII.

Trendelenburg Position.

incision to prevent pressure necrosis. Especially is this necessary in prolonged operations. The ovarian artery is ligated near the pelvic wall on one side, and a clamp forceps placed on the broad ligament between the ligature and uterus under the tube. This forceps, which is intended to prevent the reflux of blood from the uterine side, passes diagonally from the crest of the ligament to the side of the uterus, and a little above the vesical fold of the peritoneum. (Fig. 216.) Care should be taken not to include the bladder in the bite of the forceps. An additional ligature is placed on the round liga-

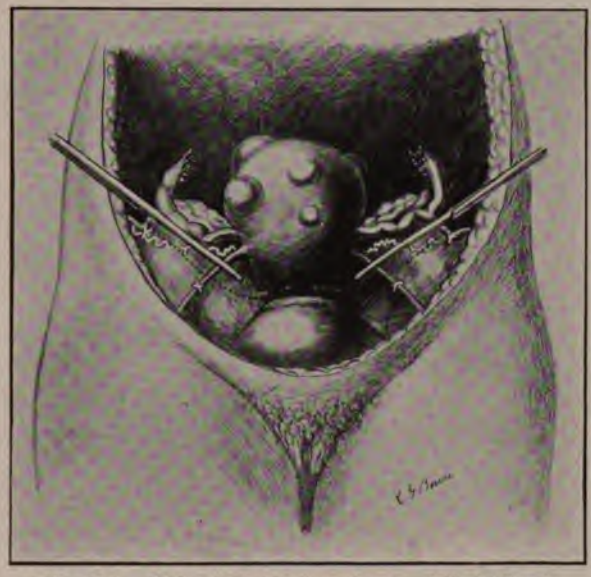


Fig. 216.—Abdominal Hysterectomy. (First Step.)
Ligatures and clamps applied to the ovarian and round ligament arteries.

ment and the tissues divided between the ligatures and forceps. Ligatures and clamp are similarly placed on the opposite side and the broad ligament divided between them. The utero-vesical fold is caught up by a mouse-toothed forceps and divided, the incision running across the anterior face of the uterus from side to side at a safe distance above the bladder. (Fig. 219.) This incision joins those of the broad ligament at either side.

The next step is to strip off the bladder and push it down. This may be done with the fingers, blunt scissors, or a sponge in the bite of a long-handled forceps. The uterine artery is next sought for by

taking the broad ligament between the thumb and fingers on a line with the cervico-uterine junction, and close to the same. The artery can usually be felt pulsating, and affords an accurate indicator for the placing of the ligature. (Fig. 223.) Should the pulsations be indistinct or questionable, a ligature placed in the same situation, but including a greater breadth of tissue, will usually catch it. Care should be taken to avoid the ureter by placing the ligature between

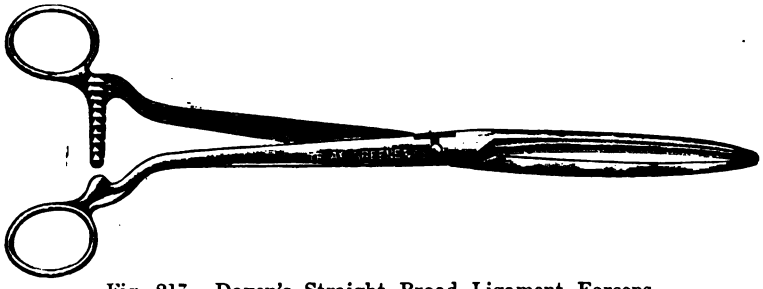


Fig. 217.—Doyen's Straight Broad Ligament Forceps.

it and the uterus, and yet sufficient tissue should be left between the ligature and uterus to prevent slipping of the latter. The ureter normally lies about one-half of an inch from the uterus at this level; but this distance may be materially increased by traction on the uterus. The uterine artery on the opposite side is secured in the same way and the uterus cut away at or below the cervical junction

Fig. 218.—Pean's Curved Broad Ligament Forceps.

in such a manner as to leave an anterior and posterior flap. (Fig. 224.)

After removal of the uterus, the field should be carefully inspected for bleeding points. If the principal vessels have been secured, there may be no bleeding of consequence. Next in order come the azygos vessels, and finally there may be troublesome hemorrhage from the raw surface of the bladder or from branches coming up

along the side of the cervix. All bleeding must be stanched before the abdomen is closed. The source of hemorrhage is sometimes difficult to locate, but by a systematic search with sponge and forceps—pushing aside prolapsed tissues, lifting up and putting upon the stretch overhanging ledges, and keeping the field as dry as possible by the assiduous use of the sponge—one will seldom fail in locating the bleeding points.

The anterior and posterior flaps of the cervix are next caught up in forceps, the cervical canal wiped with gauze, and the flaps united

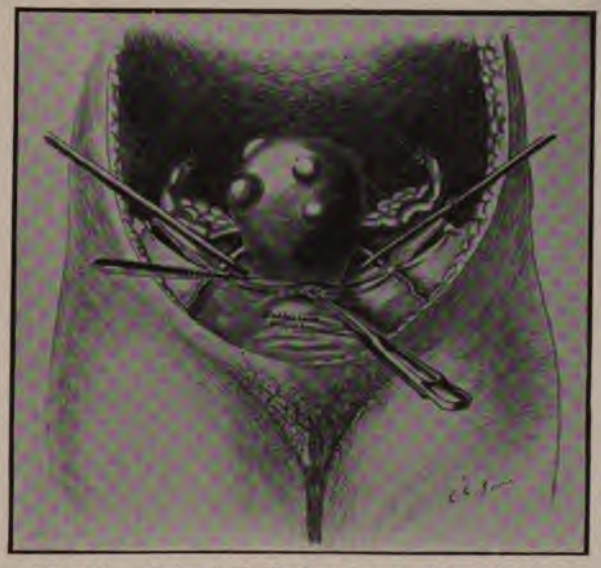


Fig. 219.—Abdominal Hysterectomy. (Second Step.)
The broad ligament has been cut between ligatures and clamps and the bladder is about to be dissected from the cervix.

by three or four interrupted catgut sutures. The gap in the broad ligament is closed by a running catgut suture from one side of the pelvis to the other. (Fig. 226.) In this way the stump is buried and becomes practically extraperitoneal. Sponges and pads are removed, the pelvis wiped dry, and the abdominal wall sutured.

Some operators prefer to cut between clamps and ligate the vessels after the uterus is removed; others prefer to isolate and ligate the vessels individually, rather than take them up *en masse*. Such matters are not of vital importance, and will be decided by each operator according to predilection.

KELLY'S OPERATION.—This (also called "hysterectomy by continuous section from one side of the pelvis to the other") is performed as follows: Commencing on one side of the uterus, the ovarian vessels and the round ligament are ligated, the bladder stripped

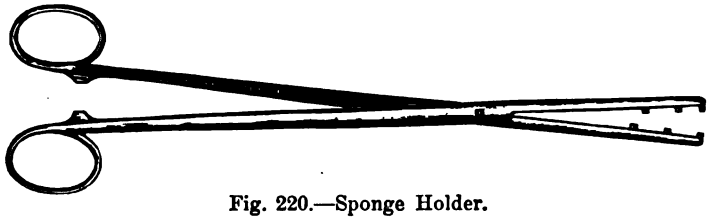


Fig. 220.—Sponge Holder.

down, and the uterine artery ligated; the uterus is then tilted to the opposite side and the cervix cut across until the uterine artery on the opposite side comes into view. This is clamped and the incision carried upward and outward toward the pelvic wall, clamps being

Fig. 221.—Deschamp's Needle.

placed on the ovarian artery before it is cut. (Fig. 227.) After the removal of the uterus the clamped vessels are ligated and the subsequent steps of the operation are as described in the preceding section. If the tumor encroaches on one side of the pelvis more than the other,

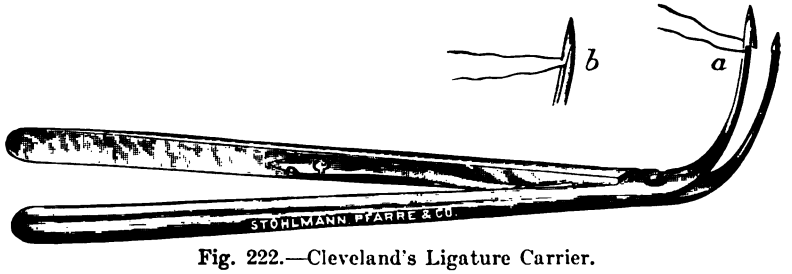


Fig. 222.—Cleveland's Ligature Carrier.

the operation should commence on the least affected side, or on the side offering the most room. This precaution is indispensable in dealing with the intraligamentous growth, and should never be disregarded. One very important advantage of the operation lies in the protection of the ureter. The body of the uterus being tilted in the direc-

tion opposite to that from which the incision is being carried, the cervix is sprung or pushed toward the knife and away from the ureter, which gives ample room for clamping or tying the artery without endangering the ureter.

The objection has been urged that the operation is inherently faulty in that the uterine artery may be cut before being clamped, and, retracting, give rise to exhaustive or even fatal hemorrhage before it can be secured. The objection is not well founded. With ordinary skill and care such an accident is not likely to occur, as the situation of the vessel as it comes up alongside the uterus is well known, and

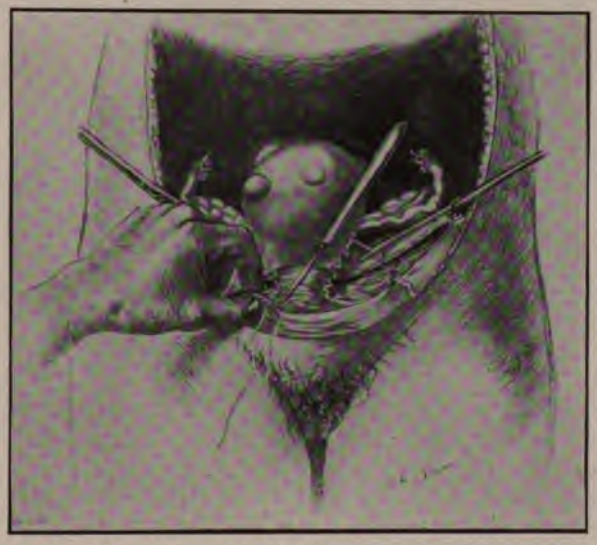


Fig. 223.—Abdominal Hysterectomy. (Third Step.)
The bladder has been dissected down and a ligature is being applied to the right uterine artery.

careful division of the last fibers of the cervix brings the vessel into view. Even should the vessel not be seen, a clamp can be adjusted, as in vaginal hysterectomy, with positive assurance that the artery is secured, and the dissection carried boldly forward.

While the Kelly operation is applicable to all forms of uterine fibroid, it is the operation *par excellence* for the intraligamentous variety. Under the old *régime* the broad ligament was split where it vaulted over the tumor, and by a process of bloody dissection from above downward the tumor was enucleated. By this method the dissection was carried from the terminal, arborescent branches of the

vessels toward the main stem in the midst of unremitting and oftentimes most alarming hemorrhage, to which many patients succumbed before leaving the table. By the Kelly method the source of the blood-supply is controlled at the outset and the remainder of the dissection is comparatively bloodless. It has been found that the

Fig. 224.—Abdominal Hysterectomy. (Fourth Step.)
All ligatures having been applied, the cervix is being cut across.

tumor is dislodged from its bed with much greater facility when approached from below. Finally, the ureter is seldom injured when the tumor is rolled out from below, whereas it is in constant jeopardy when the dissection is carried from above downward. The location of the ureter with reference to the intraligamentous fibroid is most

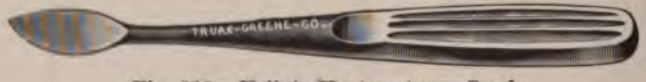


Fig. 225.—Kelly's Hysterectomy Spud.

uncertain. It may be in front, behind, over, under, or outside of the growth, and thus be cut or tied without the knowledge of the operator. When the tumor is rolled out from below these accidents may be avoided. When the intraligamentous growth dips down into the pelvis, forming an angle with the cervix, this angle is always occupied by the uterine artery, and never by the ureter. Hence, there

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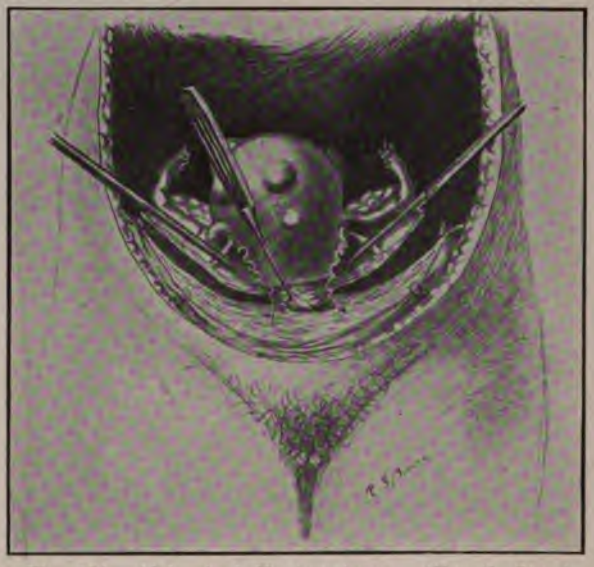

Fig. 224.—Abdominal Hysterectomy. (Fourth Step.)
All ligatures having been applied, the cervix is being cut across.

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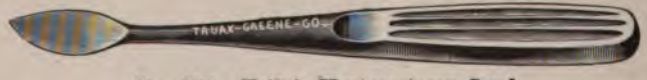

Fig. 225.—Kelly's Hysterectomy Spud.

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is no danger of including the ureter in the clamp or ligature with which the artery is secured. In some instances an intraligamentous fibroid may be more easily removed by hemisection of the uterus, the uterus being split in the median line antero-posteriorly and by cross-section at the cervical junction, reaching and securing the uterine arteries from the uterine side. (Fig. 228.) The median section is bloodless.

Panhysterectomy for Uterine Fibroid.—In case of a badly diseased cervix, cancerous degeneration of the same, or of a large cervical fibroid, it may be necessary to remove the uterus *in toto*. The steps of the abdominal operation are the same as those described

Fig. 226.—Abdominal Hysterectomy. (Fifth Step.)
The uterus having been removed, the cervix and broad ligament are being stitched.

under the head of "Supravaginal Hysterectomy" up to the point of cutting across the cervix. Some operators prefer to complete the supravaginal amputation and then remove the cervix separately. This can be easily done, and is sometimes more convenient of execution than to remove the entire mass together, especially in the case of a bulky fibroid. Usually, however, it is better not to make two bites of a cherry, and the cervix and body are removed together. It matters little whether the vagina is entered from the front or back of the cervix, the only necessary precaution being not to perforate the bladder, on the one hand, or the rectum, on the other. If both uterine arteries have been ligated, the cervix may be cut boldly away after stripping down the bladder and making the initial opening into the

vagina. Reed leaves a shell of the cervix to avoid hemorrhage from the azygos and other minor branches.

In the intraligamentous growth, however, where the section has been carried down on one side of the uterus, including the ligation of the uterine artery on that side, the technique as devised by Prior is probably the most feasible. It is substantially as follows: A pair of sharp-pointed scissors, or, better still, the perforating forceps of the author is thrust through Douglas's pouch into the vagina (being careful to keep close to the cervix) and spread so as to enlarge the opening sufficiently to admit two fingers. Two fingers of the left

Fig. 227.—Abdominal Hysterectomy. (Kelly's Method.)
The forceps are shown grasping the right uterine artery.

hand are pushed through the opening into the vagina and hooked over the cervix, to act as guides for entering the vagina in front. When the anterior opening has been made both openings are stretched by the fingers or forceps until they extend beyond the sides of the cervix. The side upon which the uterine artery has been ligated is now cut through, the uterus tilted and drawn up forcibly in the opposite direction, and the remaining uterine artery clamped from below upward. The narrow isthmus of tissue which holds the uterus is next cut through between the clamp and uterus and the organ removed. It is sometimes easier to clear the cervix from below,

as in the first step of vaginal hysterectomy, before opening the abdomen. When this is done strips of gauze should be pushed up into the peritoneal cavity as indicators, as it is not always easy to find the openings from above. The uterus being removed, and after careful hemostasis a loose gauze pack is introduced into the vagina from above downward (seeing that it extends upward through the newly made channel to a point flush with the peritoneum), over which the peritoneum is closed, the pelvic cavity is wiped dry and the abdominal wound sutured.

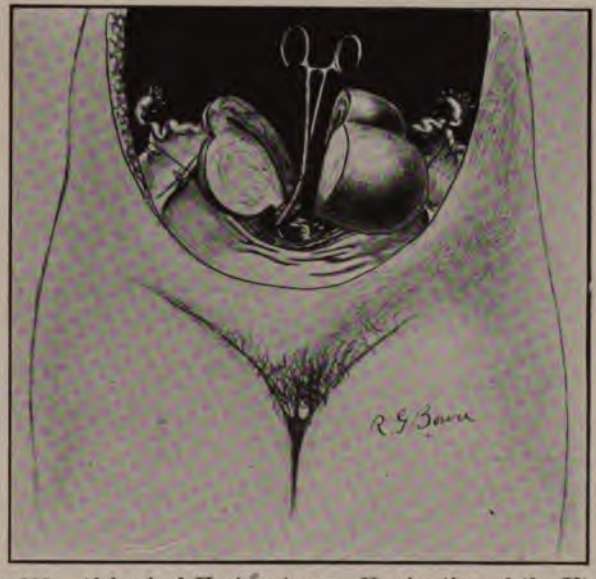


Fig. 228.—Abdominal Hysterectomy. Hemisection of the Uterus.
The forceps are shown grasping the right uterine artery.

Fibroid Polypi.—The only treatment for a polypus is extirpation. A small pedicle may sometimes be twisted off. As a rule, it is better to cut it away with knife or scissors and sear the stump, or take a few stitches in it if there be a disposition to hemorrhage. (Fig. 204.) When the polypus springs from the uterine cavity the hemorrhage following its removal may be controlled by packing. Often there is little or no bleeding. Large fibroid polypi may be cut away piecemeal until the pedicle can be reached and dealt with as indicated above. Owing to the associate purulent endometritis, curettage and packing should follow the removal of the polypus.

CHAPTER XXVIII.

INFECTIONS OF THE FALLOPIAN TUBES

WHILE the Fallopian tube, like other structures of the body, may be the seat of a variety of morbid changes and diseased processes, two are of paramount importance for their frequency and gravity.

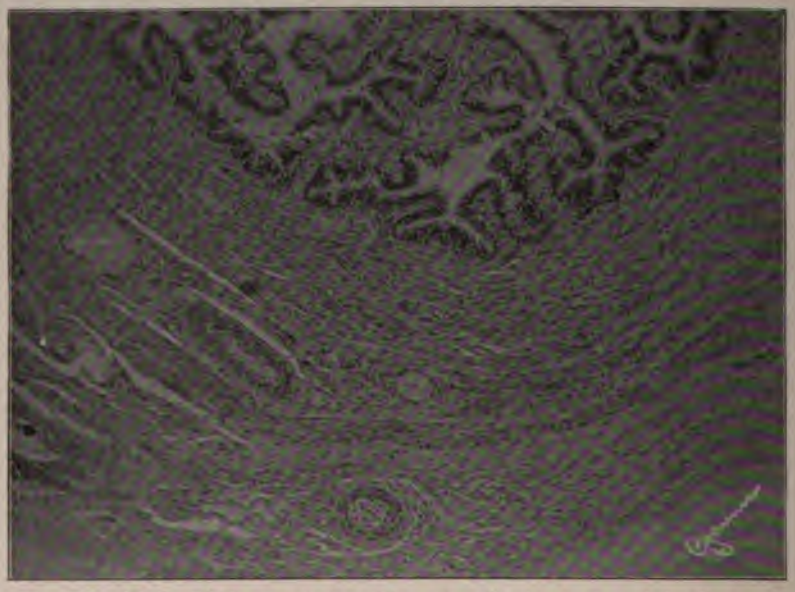


Fig. 229.—Wall of Fallopian Tube. Normal. (Photomicrograph by Gramm.)

Reference is here made to inflammation and tuberculosis. As the morbid processes of the tube are so intimately associated with and influenced by its structure, a succinct review of its anatomy will pave the way to a more ready and perfect understanding of such processes.

ANATOMY.

The Fallopian tubes spring from the uterine cornua, one on either side of the uterus, and are, on an average, about four inches in length. That portion of the tube nearest the uterus is narrow, and is called the isthmus; the outer portion is broad, and is known as the ampulla.

The tube consists of three coats, known, respectively, as the peritoneal, muscular, and mucous. The outer, or peritoneal, coat is a duplication of the broad ligament, which invests the tube in such a way as to cover two-thirds of its surface. The other one-third, having no peritoneal investment, is in direct relation with the cellular tissue of the broad ligament, and forms the upper boundary of the same. The middle, or muscular, coat is continuous with that of the uterus, and consists of unstriped muscle-fibers. It is disposed in two layers, the external of which is longitudinal and the internal circular. The internal, or

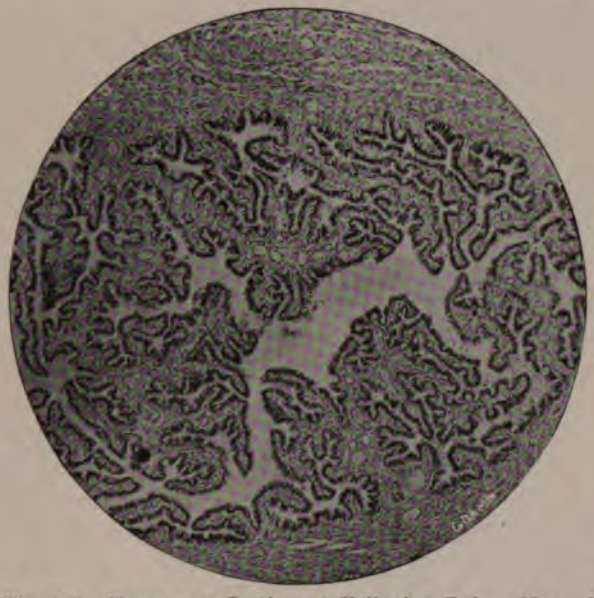


Fig. 230.—Transverse Section of Fallopian Tube. Normal. (Photomicrograph by Gramm.)

mucous, coat is continuous with the uterine mucosa, and, like it, is covered with ciliated columnar epithelium. It is highly probable that this membrane, like the uterine mucosa, contains lymphoid or glandular tissue, from the fact that adenomatous growths sometimes spring from it.

The mucous membrane of the tube is thrown into plications, or folds, which are much more pronounced in the amplified portion of the tube than in the isthmus. At the outer extremity of the tube the mucous membrane projects as a fringed border. This is known as the fimbriated extremity. The peritoneal and muscular coats terminate

abruptly in a circular, somewhat constricted, ring at the base of the fimbria. At either extremity of the tube is a constricted orifice, the inner of which communicates with the uterine and the outer with the peritoneal cavity. The first is called the ostium internum, and the second the ostium abdominale. The caliber of the tube increases from the uterine to the abdominal extremity. At the uterine extremity it is very small, barely admitting a bristle.

The most important items in connection with the anatomy of the tube in relation to its pathology are the continuity of its lining with that of the uterine cavity; the relation of the uncovered portion of the tube to the cellular tissue of the broad ligament; and the outer opening of the tube, which communicates directly with the peritoneal cavity. The first provides for an extension of the inflammation, simple or infectious, by continuity from the endometrium to the mucous lining of the tube; the second by extension by contiguity from the tube to the cellular tissue of the broad ligament; and the third for an escape of infectious matter from the tube into the peritoneal cavity.

INFLAMMATION OF THE FALLOPIAN TUBES (SALPINGITIS).

Inflammation of the Fallopian tubes is of exceeding frequency. It is the most common of all diseases to which these structures are liable. Because of its frequency, tenacity, and the serious changes, both structural and functional, which it entails, it is more productive of invalidism than any other of the diseases peculiar to the sex.

Causes.—In the vast majority of cases the inflammations of the Fallopian tube come by way of the uterus. The continuity of structure between the lining membrane of the uterus and tube provides an unobstructed thoroughfare by which the inflammation may travel unhindered. Tubal inflammations are, almost without exception, infectious in character and of microbic origin. While it is possibly true that a simple inflammation may result from direct injury, or from the congestion incident to suppressed menstruation, or may even be transmitted from the uterine cavity, such inflammations are so rare and usually so transitory as to be of little consequence.

It has been the custom to classify the infectious inflammatory diseases of the Fallopian tubes into septic and specific, or gonorrheal. This classification, while possessing the merit of simplicity, is no longer tenable in the light of modern bacteriological research, as sepsis is common to all forms. Furthermore, with increasing knowl-

edge of the multiplicity of germs concerned in the morbid processes of the tubes, and their individual traits, it is not practicable at present to classify them in groups without imparting a warped conception of their distinctive attributes and pathogenic function.

The germs principally concerned in the production of infectious inflammation of the Fallopian tubes are the streptococcus and gonococcus. The gonococcus is the specific germ and essential cause of gonorrhea. A very large majority of the infectious inflammations of the tube are of gonorrheal origin. The streptococcus, or erysipelas germ, is very prevalent, and is the underlying cause of many infectious processes in man, and may be communicated to the genital tract by the fingers or instruments in making examinations or in performing operations. These facts, because of their great practical importance, will be reiterated and emphasized throughout the consideration of this subject. We shall now proceed to a more detailed description of the *modus operandi* by which the individual germs affect the tubes.

STREPTOCOCCIC INFECTION OF THE FALLOPIAN TUBES.—Streptococcic infection of the Fallopian tubes is usually the result of contamination from unclean fingers or instruments in conducting examinations or performing operations about the genital tract. The puerperal state is peculiarly auspicious for the development of streptococcic infection; consequently it is found most frequently and in its most aggravated form in connection with abortion, miscarriage, or labor at term. The non-gravid uterus will stand, with comparative impunity, an amount of injury and exposure to this form of infection that would be disastrous in the gravid or recently delivered uterus. The same statement applies to other sections of the genital tract. The *source* of infection may be the uterine cavity (usually the site of placental implantation), a lacerated cervix, a lacerated perineum, or even an abrasion of the vagina or vulva.

The *route* of the streptococcus, so far as can be determined by observation and deduction, is, for the most part, by way of the lymphatics, and, in consequence, its manifestations are first and most notably found in the subepithelial and deeper layers of the distal portion of the tube, which are in the direct line of the lymphatics, and for the same reason the tubal infection is attended with more general and earlier involvement of the surrounding structures than in gonorrheal infection. As the lesion from which the infection is spread is often situated on one side of the sagittal line entirely within the province of either the right or left lymphatic system, it follows that the tubal infection is as frequently unilateral. The route of the strep-

tococcus, leading it in at the back door and up through the deeper structures of the tube, results in destructive lesions of the same before involvement of the epithelial clad surfaces of the mucosa. When, later, desquamation of the epithelium takes place, it is not in the form of individual cells, as in the gonococcic infection, but is thrown off in floes, as the result of an undermining necrosis.

Streptococcic infection of the Fallopian tube, as compared with that of the gonococcus, is characterized by greater celerity and intensity, more prolonged acuity, and broader dissemination. The invasion is rapid, and the symptoms, both local and general, pronounced from the outset. The attack is usually ushered by a chill or chilly sensations, and the temperature mounts to 100 to 105 degrees, with a pulse-rate of from 100 to 140. The patient seldom leaves her bed in less than three weeks, and may be confined for as many months. Quite early the effects of the disease on her general system are plainly manifest in the pallor, loss of flesh and strength, and general decrepitude. Exceptionally, the disease pursues an unostentatious course indistinguishable from that of some of the milder infections.

Gonococcic Infection of the Fallopian Tubes.—The presence and position of the gonococcus in the Fallopian tubes are important as indicating the character of the inflammation and its manner of extension. While it is a demonstrable fact that purulent inflammation of the Fallopian tubes is due, in the majority of instances, to gonorrheal infection, yet the gonococcus can only be found in about 20 per cent. of the cases. This does not indicate its absence as a primary and essential factor in the disease, but rather an extinction of germ-life under circumstances adverse to its life and propagation. It is a well-known fact that germs will perish in their own secretions if pent up, and will starve to death on uncongenial soil if prevented from migrating. The gonococcus is short-lived and perishable, and must be fostered with care to insure perpetuation of the species. There are certain localities in which it will live and thrive indefinitely, such as the vulvo-vaginal glands and Skene's ducts, and it will hold with considerable tenacity to the urethra, cervical canal, or even the utricular depressions of the uterine cavity; but in the closed Fallopian tube it is usually short-lived.

The habitat of the gonococcus in the tube is of no less interest as indicating the manner in which it excites inflammation, but also the probable route by which it finds entrance to the tube. Almost all observers agree that the germ is a surface rider, and has little or no disposition to ensconce itself beneath the surface of living tissues.

Further, that it finds its favorite abode in the slime or scum of suppuration which covers the living tissues: in the leucocytes, detached epithelium, or unconfined. It is seldom found in the living epithelial cell *in situ*, nor yet in the leucocytes between them.

The desquamation of epithelium in gonococcic infection is in the form of individual cells in contradistinction to that of streptococcic infection where it is shed in patches. Gonococcic invasion of the tube excites inflammatory reaction, not only in the mucosa with which the germ may be in contact, but also in the muscularis, and not infrequently the peritoneal investment. This would lead to the inference that the inflammation was not so much due to the contact with the germ itself, if at all, as from toxins secreted by the germ and which percolate through the tissues.

Route of Invasion. — One fact well established and generally accepted is that tube infection by the gonococcus almost invariably proceeds from the uterine cavity. The other facts are generally conceded: 1. That the most common route of invasion of the Fallopian tube by the gonorrheal germ is by continuity over the mucous membrane from the endometrium. 2. That the gonorrheal germ may follow the blood and lymph channels. Evidences of this fact are numerous and incontestable. The micro-organism has been demonstrated in the blood, in the endocardium, and in the large serous cavities: the pleura, pericardium, and peritoneum. It has been found in the course of the lymphatics, and not infrequently gives rise to superficial or deep-seated inflammation of the lymphatic glands along the line traversed by the lymphatics which drain the genital organs. A most familiar example of this is found in the gonorrheal bubo. Nevertheless, this method of infection of the tubes is of extreme rarity, and for all practical purposes may be ignored. Migration of the gonococcus through the tissues has not been proven, and is at such variance with its known habits as to excite the gravest doubts as to its feasibility. There remains then, practically, but one route of gonorrheal invasions of the Fallopian tubes, and that is by the way of the mucosa.

Miscellaneous Germs.—Besides the streptococcus and gonococcus, a number of other germs are occasionally concerned in the production of salpingitis. Among these are the staphylococcus, bacillus coli communis, pneumococcus, and the tubercle bacillus. Staphylococcic infection of the tube, contrary to previous belief, is comparatively rare, and plays a very unimportant rôle in the inflammatory affections of the same. The bacillus coli communis is oc-

casionally found, but always as the result of intestinal adhesion to the tube. It may be communicated from an adherent and diseased vermiform appendix, with which tubal disease is not infrequently associated. This form of infection, when it occurs, is characterized by great violence and profound systemic disturbance. Fortunately for the patient, the pus formation, which is abundant and venomous, usually finds exit through the intestine. The pneumococcus is found so rarely as to be more a matter of curiosity than of practical importance. The tubercle bacillus, on the contrary, is of such paramount importance as to demand separate consideration.

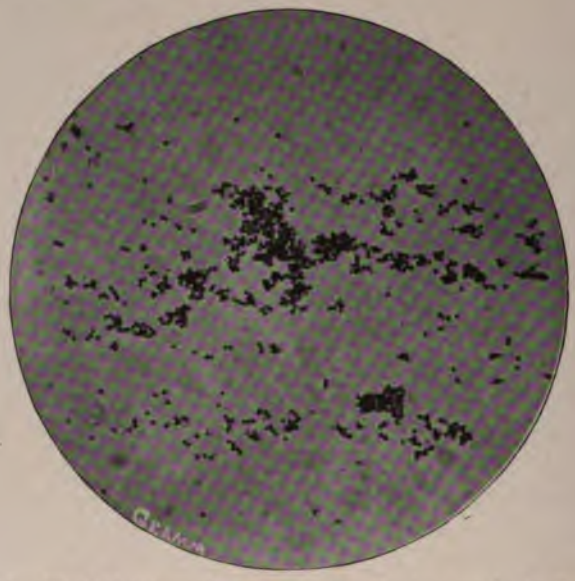


Fig. 231.—Staphylococcus Pyogenes. (Photomicrograph by Gramm.)

Other Causes.—It is a fact well established that certain general infections, such as measles and scarlatina, may give rise to salpingitis. Such cases are seldom found in their active stage, and are recognized chiefly by their results. Fortunately for the innocent virgin, in whom such conditions are found, an explanation is offered by this mode of infection which does not impugn her chastity. The salpingitis so commonly associated with the uterine fibroid, and occasionally with other pelvic tumors, depends, in most instances, on germ infection, made possible by the diminished resistance of the involved structures to the ordinary sources of infection.

Varieties.—Salpingitis occurs under two forms: catarrhal and interstitial, either of which may be acute or chronic.

CATARRHAL SALPINGITIS.—In catarrhal salpingitis the disease is limited to the mucous membrane of the tube. It is characterized by hyperemia and thickening of the membrane, increased secretion of mucosa, and probably by a slight degree of enlargement of the tube. There are no definite symptoms, and the condition generally goes unrecognized. The disease usually terminates in resolution or, by extending to the deeper structures, merges into the second form.

INTERSTITIAL SALPINGITIS.—When the deeper structures of the tube are involved in the inflammatory process, the condition is known as interstitial salpingitis. The inflammation may be confined to the mucous and muscular coats, or may involve the entire thickness of the tube, including the peritoneum. The structures become congested, infiltrated, and thickened, and the tube elongated, tortuous, and increased in diameter. The changes are more marked in the ampulla than in the isthmus; so that the tube becomes distinctly enlarged in its outer half. That portion of the tube attached to the mesosalpinx does not elongate in proportion to the rest of the tube, and produces an effect somewhat analogous to chordee in the male: that is, the tube is curled upon itself, which, in connection with the clubbed extremity, gives it a retort-like appearance. The ovary is usually embraced in the concavity of this curve. The isthmus, while it does not participate in the enlargement to the extent of the ampulla, nevertheless becomes infiltrated and of cord-like density. Under these conditions the tube becomes friable and sometimes almost cheesy in consistence. Section of the tube will disclose a swollen mucous membrane, bathed in pus or muco-pus, distorted plicæ, exfoliation of epithelium, and thickened, degenerated walls, which under the lens are frequently found infiltrated with pus-corpuscles.

The ulterior effect on the tubal structure will depend upon the virulence of the poison and the activity and persistence of the inflammatory reaction. A mild poison with moderate inflammation may leave the tube somewhat enlarged and infiltrated, but with the subsidence of the reaction the products may be absorbed, leaving the tube little the worse for the ordeal. Again, resolution may be incomplete and the tube left more or less distorted and crippled. A low grade of inflammation persisting for months or years may result in an overgrowth of connective tissue, with consequent destruction of the normal histologic elements, under which the tube will become converted into a dense, fibrous structure. This latter is frequently

spoken of as fibrous degeneration of the tube. More frequently the inflammation is of a more active type, resulting in the formation of pus, both in the canal and in the interstices of the tube-wall.

In many instances before this stage is reached the infectious matter will have found its way into the peritoneal cavity, either through the ostium abdominale or the walls of the tube. This will excite a localized peritonitis, with an exudation of plastic matter, which will usually result in sealing the point of leakage, or in walling off the peccant matter from the general peritoneal cavity. This eminently conservative process is the safeguard against general infection. When the poison is of extreme virulence or escapes too freely, extensive or general peritonitis supervenes. Such a result is exceptional save in the puerperal septic form. The plastic exudation may agglutinate the fimbriated extremity of the tube to the ovary, or any portion of the tube to the contiguous structures: the broad ligament, uterus, intestines, or bladder. Usually the inflamed and heavy tube sinks lower in the pelvis, either at the side or back of the uterus, and, through one of those remarkable conservations of Nature, wraps itself in the broad ligament, that it may not be the source of more extended infection.

More frequently the escape of septic matter into the peritoneal cavity is prevented by the closure of the ostium abdominale. This is effected by an elongation of the muscular and peritoneal coats, with a coincident curling inward of the fimbria and a closure of the circular orifice, which is finally sealed by a plastic exudation and adhesion of the peritoneal margins. This serves the purpose of retaining the secretions within the tubal canal. The uterine end of the tube usually also becomes sealed, or so diminished in caliber as to offer an impediment to the passage of the fluid in that direction. In consequence the tube becomes distended with the secretion. This secretion may be purulent, bloody, or watery in character, constituting the three forms of retention cyst; known, respectively, as pyosalpinx, hematosalpinx, and hydrosalpinx.

Pyosalpinx.—This, as already indicated, is an accumulation of pus within the lumen of the tube. Such accumulations sometimes assume large proportions so that the tube may attain the size of the fetal head. As ordinarily found, the tube does not often exceed the size of a Bologna sausage. (Fig. 232.) The tubal walls are of unequal thickness and usually friable; so that care and dexterity are necessary to prevent their rupture during the process of enucleation. They occasionally rupture spontaneously, with most disastrous results. This

accident would be much more frequent were the tube not walled in and protected by neighboring viscera, which are agglutinated to it by peritoneal exudation.

The contents of the tube vary in virulence according to the stage of the inflammation. The nearer the onset of the inflammation, the more virulent the pus. Old accumulations of pus are apt to be sterile from the death and decadence of germs. Six weeks of uninterrupted quietude will usually suffice to render the contents of a pus-tube innocuous. This, however, does not apply to the streptococcus, as it is more tenacious of life, and may retain its virulence for a long period. A fresh invasion of germs may occur at any time, with the effect of restoring the virulence of the tubal contents. This is usually the result of injury or irritation: violence or excess. This renewed

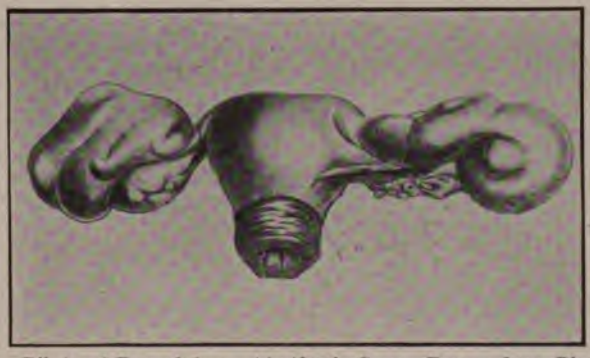


Fig. 232.—Bilateral Pyosalpinx. (Author's Case. Drawn from Photograph.)

infection may come by way of the uterus or from an adherent bowel or bladder.

Salpingitis associated with the formation of pus is very persistent, and will often continue during the active, sexual life of the woman. It remains as a smoldering fire, to be fanned into a blaze by accident, exposure, or over-indulgence. These relapses occur at longer or shorter intervals, but can be predicated in the average case with almost absolute certainty. After the menopause, with its coincident atrophy, ischemia, and enervation of the genital apparatus, the trouble ceases. It has been asserted that under favoring circumstances the pus may undergo fatty degeneration and absorption or be deposited on the sides of the tube as inert and innocuous matter.

Hydrosalpinx. — In hydrosalpinx the contents of the tube are watery. They sometimes are variously tinted from the admixture of

blood. The tube-wall is thin and transparent, and in old cases consists of little more than peritoneum and connective tissue. (Fig. 238.) The contents are bland and unirritating and devoid of germs. Spontaneous cure sometimes occurs from rupture and collapse of the tube, the contents being absorbed by the peritoneum.

The pathogeny of hydrosalpinx is very imperfectly understood. By some it is regarded as representing the first or last stage of salpingitis. According to this view, it may occur as a serous effusion, the result of a mild salpingitis, or as the final stage of a pyosalpinx in which the pus has undergone caseous degeneration and absorption, or deposition, leaving the clarified contents of the tube as a limpid, watery fluid. Not infrequently evidences of such a change are found in caseous matter clinging to the sides or ensconced in the recesses of the tube. The fact of the ostium abdominale being occluded has been regarded as *prima facie* evidence of an infectious matter in the tube at an earlier period; so that the initial fluid must have contained germs. The addition of pyogenic germs to the fluid would convert the hydrosalpinx into a pyosalpinx. In the absence of such germs sterilization evidently occurs. My own opinion is that the pathogenic germ of hydrosalpinx has as yet been undifferentiated. The distended tube of hydrosalpinx may contain a pint or more of fluid, but it seldom attains a size larger than a pear.

Hematosalpinx.—In hematosalpinx the contents of the tube consist of blood. Intratubal hemorrhage from a malignant growth or tubal pregnancy does not properly belong under this head. Hematosalpinx may be produced by interference with the venous circulation of the tube, whereby the blood is dammed up and escapes by rupture of the vessels, as in torsion of the tube and venous thrombosis; by a reflux of blood from the uterus in genital atresia or as the result of spastic uterine contractions; by a vicarious tubal menstruation, and by traumatism. It is believed that in the majority of cases hematosalpinx arises from an effusion of blood into a hydrosalpinx. The closure of the abdominal ostium in hematosalpinx has been variously ascribed to intratubal infection, peritubal infection, and the influence of extravasated sterile blood.

Pathology.—The lesions resulting from salpingitis are numerous and varied, and depend upon the character and virulence of the infection and the intensity and duration of the inflammation. In the absence or paucity of pus-forming germs there may be little or no suppuration, and yet the infectious matter may be sufficiently irritating to produce marked changes in the tube and its environments.

Thus, the tube may be enlarged, infiltrated, and distorted without the presence of pus. Should any of this fluid escape into the peritoneal cavity, a localized peritonitis, with or without adhesions, will result. A lingering non-purulent inflammation of the tube occasionally results in an overgrowth of the connective tissue, which, as it contracts and hardens, reduces the tube to a hard, fibrous cord. In the intenser forms of infection incident to the puerperal state the poison sweeps through the system with the fury of a tornado, leaving few scars and oftentimes no pus to mark its deadly course. It is neither rational nor safe, therefore, to gauge the virulence of an infectious fluid by the amount of pus which it contains. Nevertheless, in most instances, the more virulent infections of the tube are attended by the formation of pus, which infiltrates its walls, slimes the mucosa, or, if the tube is sealed, accumulates within and distends it.

The escape of infectious matter from the tube into the peritoneal cavity, either through the ostium or the walls of the tube, is the signal for a battle. Myriads of cells are marshaled to the spot to oppose the invaders, and the field is bestrewn with the dead on both sides. Coincidently with the marshaling of the phagocytes an attempt is made to fortify against the invader by constructing a wall of defense between the avenue of entrance and the general peritoneal cavity. For this purpose an exudation of plastic matter is thrown out which completely surrounds the germ-infested district, and shuts it off. In building this wall every organ and structure within reach is utilized: intestine, omentum, broad ligament, uterus, bladder, and abdominal wall, separately or collectively, as the case may be. These are cemented and covered by plastic matter so as to present an impassable barrier.

This, then, is the explanation of the adhesions so frequently found in connection with and following an attack of salpingitis. It is eminently a conservative process, but, as will appear later, is not an unalloyed benefit. In this environment the ovaries and tubes are oftentimes completely enveloped. In professional parlance they are "snowed under," and cannot be outlined. The exudation with the agglutinated structures will sometimes form a mass which fills the pelvis and extends well up into the abdomen. The untrained are very apt to be deceived as to the size of the appendages in such cases, conceiving them to be much more bulky than they really are. After entering the abdomen and separating the adhesions, he finds, to his surprise, that they only form the nucleus of the mass which he had mapped out by bimanual examination.

The plastic matter thrown out to protect the general peritoneal cavity may undergo one of three changes, and it is upon the character of the changes that the future welfare of the patient depends.

1. It may be absorbed, leaving the tube free.

2. It may melt down into pus, leading to distressing sequelæ.

3. It may organize, whereby it becomes endowed with a vitality which assures its permanency.

The adhesions are not always effective. Before the intensely virulent germ they melt away and cease to offer successful resistance. As a rule, they serve the purpose for which they were intended, and confine the infectious matter within safe limits.

The adhesions vary in character and arrangement. The recent adhesion is soft and creamy, but in time becomes firm and resistant.

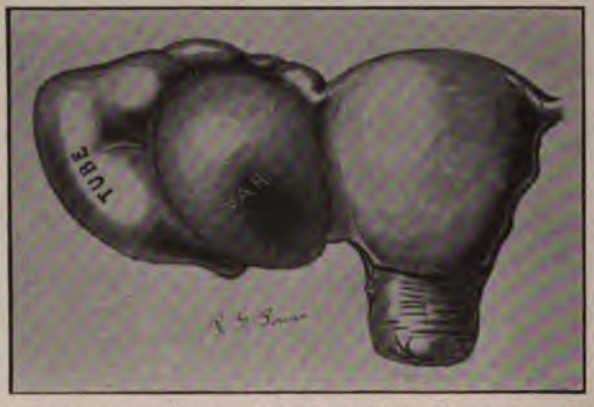


Fig. 233.—Tubo-ovarian Abscess. (Author's Case. Drawn from Specimen.)

It sometimes forms a layer between two broad, contiguous surfaces like two pieces of buttered bread applied face to face. These are spoken of as bread-and-butter adhesions. A thin, gauze veil falling over the organs is called spider-web adhesions. Sometimes the adhesions are disposed in the form of bridles or bands between more or less widely separated structures. Very dense adhesions are spoken of as fibrous, or leathery.

Adhesions to the tube not only bind it down, but sometimes produce sharp flexures, which diminish or even obliterate its canal. The bowel may likewise be angulated so as to greatly embarrass its vermicular motion and impede the passage of its contents. Cases of obstruction are not rare from this cause. Other viscera may be interfered with. The erectile tissue, such as abounds in the genital ap-

paratus, may suffer from the enforced restraint imposed by the adhesions. This applies with special force to the uterus and tubes during the menstrual molimen and under sexual excitement. One form of dysmenorrhea—the so-called tubal—is largely due to the fixation and compression of the tube under congestion. Ureteral obstruction and irritability of the rectum and bladder are often due to the same cause.

The plastic matter forming the adhesions sometimes becomes infected and breaks down into pus. The pus usually forms in little pockets along the course of the tube or in the vicinity of the tubal orifice, and constitutes what is known as multiple pelvic abscess. Leakage of infectious matter through the walls or from the orifice of the tube is the exciting cause. An ovary may be agglutinated to the tube, either at its fimbriated extremity or by contact with its wall. In case of pyosalpinx infection may be communicated to the ovary, leading to the formation of an abscess in its substance. Such an abscess communicating with a tubal abscess through an opening between them constitutes *tubo-ovarian abscess.* (Fig. 233.) It is probable that in many instances a burst Graafian follicle is the avenue by which infection takes place. Occasionally, though not with the frequency one might expect, the cellular tissue of the broad ligament becomes infected through that portion of the tube which is in contact with it and which has no investment of peritoneum. This gives rise to cellulitis, and may end in pelvic abscess. As will be seen later, cellulitis is usually the result of streptococcic infection through the lymphatics coming from the uterus or lower genital tract.

Effects on Function.—The chief function of the Fallopian tube is to conduct the ovule from the ovary to the uterine cavity. The essentials for the proper performance of this function are flexibility of the tube, perviousness of the canal, and an unbroken line of ciliated epithelium to waft the ovule on its way. As has been seen, one of the results of salpingitis is the destruction of the ciliated epithelium in its entirety or in patches. Another is thickening and rigidity of the tube, and still another the angulation or bending of the same whereby its caliber is reduced or obliterated at one or more points. The result is that the ovule is arrested in its passage, or makes a difficult and halting journey toward the uterine cavity, which, if it succeed in reaching, does so in an enfeebled and decrepit condition incapable of fecundation. The natural result is sterility. Should the spermatozoa find their way into the tube and find the ovule blockaded, and fertilization ensue, a tragical event will have occurred, for the result will be tubal gestation.

CHAPTER XXIX.

SALPINGITIS: SYMPTOMS, DIAGNOSIS, AND MEDICAL TREATMENT.

Symptoms.—The symptoms of salpingitis depend upon the stage of the disease, its intensity, and the anatomic parts involved. It should not be forgotten that an inflammation of the Fallopian tube is seldom confined to the tube alone, but is constantly associated with endometritis and very frequently with ovaritis, localized peritonitis, and occasionally with pelvic cellulitis. None of these has symptoms so distinctive as to be regarded as pathognomonic, nor is it possible to eliminate the symptoms belonging to any one of them from the complex as usually found. The chief symptoms are pain, hemorrhage, and discharge, with now and then an increase of pulse and temperature.

The *pain* varies in character and in intensity, both in different individuals and in the same individual at different times. Some women pass through the entire cycle of pathologic changes due to tubal inflammation, even to the point of complete destruction of the tubes, without at any time experiencing a degree of suffering to send them to bed. Others—and these constitute the great majority—will suffer almost continuously from the pain and discomfort attending the inflammatory process. The pain varies in character. It is at times dull and heavy, at others sharp and lancinating. This latter is usually regarded as of peritoneal origin, and denotes a localized peritonitis. In most instances the pain is paroxysmal, with remissions or intermissions in which the patient is comparatively easy. The paroxysms may amount to agony uncontrollable by the ordinary methods of medication. The pain is usually referred to the region of the ovaries, whence it radiates throughout the pelvis and down the anterior aspect of the thighs.

Even in the absence of notable pain, and conspicuously so in its presence, *tenderness* over the site of the tubes may be elicited by pressure or succussion. The suffering is intensified by the erect posture, by bodily movements, and by the congestions incident to menstruation and sexual excitement. Walking and riding are decidedly

uncomfortable, and in aggravated cases unbearable. The woman stands and walks with the body inclined forward; her movements are deliberate and cautious; in rising or sitting she eases herself into position by the aid of her hands; and in riding sustains herself with hands upon the seat, to deaden the effect of jars. Distension of the bowels and bladder are painful, and efforts at evacuation more so. The bowels become torpid and the bladder irritable; hence constipation and frequent urination often go hand in hand. Sexual intercourse is painful and oftentimes unbearable. A peculiar form of dysmenorrhea occasionally attends such cases. It is due to the congestion and swelling of the bound-down tubes and ovaries incident to the menstrual effort. The pain, which may be agonizing, begins from several days to a week before the flow, and continues throughout the period. The pain is referred to the region of the ovaries, which distinguishes it from the purely uterine dysmenorrhea, which is located nearer the median line and seldom precedes the flow by more than a few hours.

Hemorrhage.—In most instances an increased frequency and duration of menstruation accompany the severer forms of salpingitis, especially marked in the stages of exacerbation. Exceptionally, and for no apparent reason, menstruation is diminished or suppressed. This latter is very apt to occur in the salpingitis of tuberculosis, and should arouse suspicion.

Discharges.—The discharges are in no way characteristic, and are significant only in so far as to indicate a pelvic lesion, which in conjunction with other signs and symptoms helps to round up the symptomatology and confirm the diagnosis.

Pulse and Temperature.—At the onset of an acute interstitial salpingitis, and with each exacerbation, the pulse is accelerated and the temperature increased. But the febrile excitement is not of long duration, nor, as a rule, is it marked. It is questionable whether an infection confined to the tube is capable of producing a febrile reaction. The chances are that in those cases in which it occurs there has been an escape or absorption of septic matter from the tube. With the formation of pus, especially if it occur in the lymph-beds surrounding the tubes, there may be a more or less persistent elevation of temperature, with or without an increased pulse-rate. Such cases will also be attended by the other evidences of mild septic infection.

A very characteristic feature of tubal infection is the occurrence of exacerbations at irregular intervals. Between them the woman may

be comparatively free from symptoms, or even imagine herself cured; but, if pus be present in or about the tube, it is a smoldering fire, to be fanned into a blaze by accident or indiscretion. Most of these exacerbations are due to leakage of pus from the tube or its environment, less frequently from a reinfection. At such times all the symptoms are intensified, and the woman takes to her bed. Pelvic peritonitis may ensue. This is signalized by an abrupt elevation of the pulse and temperature, usually preceded by a chill. The pain is increased, and is continuous, with paroxysms of great intensity. The abdomen is distended, tympanitic, and exquisitely tender. The abdominal walls are rigid, the bowels constipated, and the patient is harassed with frequent, painful, gaseous eructations from the stomach. The facial expression denotes suffering. She lies on her back, with her legs drawn up to relax the abdominal muscles and diminish the intra-abdominal pressure.

The Sepsis Resulting from Pelvic Infection.—In suppurating cases some women lapse into a condition of serious invalidism, which comes, in great measure, from septic infection from the pelvic pus-depots. Sepsis of a more or less severe type is so constant a factor in the systemic disturbances arising from the pelvic infectious diseases, and is so habitually unrecognized as such, that a few words with reference to its less pronounced forms will not be inappropriate. It should be borne in mind that sepsis does not emanate alone from pus formation, but may arise from any germ-laden fluid or germ-infested tissue.

While violent, general septic infection is easy of recognition, the usual conception of the more common and milder forms is hazy and ill defined. It may be laid down as a rule to which there are few exceptions that systemic phenomena attending pelvic disease is of septic origin. There are no pathognomonic symptoms which can be attributed to either of these, and yet, if one or two essential points be borne in mind, misinterpretation of mild sepsis will but seldom occur.

As an illustration of one of the most common of the pelvic disorders we shall take a case of pyosalpinx. A sterile pyosalpinx gives rise to no systemic disturbance, but a pyosalpinx in its active stage, where the germs are abundant and vigorous, produces systemic phenomena of a violent or subdued type, according to the amount of general infection. The toxins are absorbed and distributed, and the effect is manifested in the morbid reaction which follows throughout the body.

The most constant and essential feature of the less deadly forms of sepsis is fever. This is of greater or less intensity, and is usually ushered in by a chill or chilly sensations. The general effect of the poison in the system is to produce a depression of all the vital energies. The woman feels weak and indisposed, if not positively ill. The appetite and digestion are impaired, and there may be vomiting and diarrhea. The impress on the nervous system is manifested by nervousness, wakefulness, and depression of spirits, or occasionally by mental hebetude and somnolence. The ulterior effects are pallor, emaciation, and debility. In very mild or evanescent forms a slight elevation of temperature, often so slight as to be unsuspected unless measured, and an almost inappreciable weakness and malaise, may be the only indications of infection.

Physical Signs.—In the initial stage of an acute attack it is seldom that a satisfactory examination can be made, owing to the exquisite tenderness of the parts. Moreover, at this stage the tubes are soft, pliable, and mobile, and elude the touch. About all that can be determined is an indefinite fullness in the locality of the tubes, which, taken in connection with the pain and tenderness, is very significant. Later, after the subsidence of the acute symptoms, the tubes may be distinguished as elongated, tortuous, indurated masses, pendent or extending outward from the uterine cornua. Their position varies, as also their contour. They are almost invariably sunken in the pelvis by reason of their increased weight. They are quite frequently found deep down in the pelvis at the sides, or back of the uterus. Occasionally they are found resting on the bladder, or on the anterior surface or fundus of the uterus, when that organ is retroverted. Whether extended or coiled or bound to the uterus, careful bimanual examination will usually determine their attachment to the uterine cornua by tracing the cord-like isthmus from tumor to uterus or *vice versa.*

Bimanual examination is much more satisfactory in women with thin and flaccid abdominal walls, but even in thick-walled women the finger in the vagina, with counter-pressure from above, can usually trace and outline the tube from the vaginal side. When there is much exudation, with adhesions to the surrounding structures, a conglomerate and indefinite mass will occupy the position of the tube. Under such circumstances the tube can neither be palpated nor outlined. Hydrosalpinx and hematosalpinx present to the finger as soft, thin-walled cysts occupying the position of the tube, and usually preserving the elongated outlines of the moderately distended tube.

In many of these conditions rectal examination will be of the greatest assistance in determining the situation, character, and extent of the pelvic lesion.

Diagnosis.—In forming a diagnosis the history, symptoms, and physical signs should all be taken into consideration. In a case of recent origin, the history of a suspicious intercourse, miscarriage, or labor at term, or, in lieu of which, evidence of an existing gonorrhea, or of recent delivery coupled with pelvic pain and tenderness in the region of the ovaries, and a well- or ill- defined fullness at the side

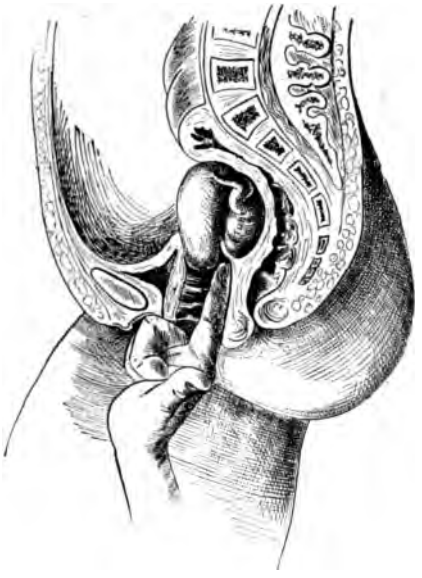


Fig. 234.—Enlarged Tube and Ovary Simulating Retroversion of the Uterus.

or back of the uterus, are almost sufficient to justify the diagnosis of tubal infection. Later in the disease, when the tubes have become thickened and hardened and the tenderness abated, there will usually be little difficulty in outlining the tubes. They will often be felt as elongated, tortuous bodies extending from the uterine cornua across the pelvis, or as coiled masses at the side of or behind the uterus. Occasionally they will be curled up on the fundus or nestled in the vesico-uterine space. When the tubes are rolled up and glued to the posterior aspect of the uterus, the resemblance to a retroflexion is

sometimes very puzzling. (Fig. 234.) The pain, tenderness, and other evidences of pelvic inflammation should here put one on guard. A careful rectal examination will usually locate the fundus in its proper relation and in most instances there will be found a well-defined sulcus between the uterus and the attached mass, or at least a broken line or absence of continuity, such as would exist if the organ were bent upon itself. If doubt still exists, the gentle introduction of the uterine sound will reveal the position of the uterus and its relation to the mass. In long-standing cases, in which nothing remains but the atrophied tube invested with its fibrous adhesions, about all that can be made out will be a cord-like process occupying the position of the tube and an indefinable sense of crumpling and contraction of the peritoneal pouch.

Hydrosalpinx and Hematosalpinx are soft, thin walled, and fluctuating, and are usually unilateral. They are not, as a rule, tender, and if not overdistended are elongated and present indentations on the surface corresponding to the furrows of the normal tube. They are indistinguishable one from the other, and usually difficult to distinguish from other small pelvic cysts. This difficulty is increased when the tube becomes spherical from overdistension and when it is adherent. It may be mistaken for an ovarian, parovarian, or broad ligament cyst, or even an ectopic pregnancy. The attachment of the tube to the uterus, when it can be made out, together with its size and shape, will serve to distinguish it from either of the above-named cysts. Also, if the normal ovary can be made out on that side, ovarian cystoma can be excluded. Ectopic gestation would be excluded by the absence of its characteristic symptoms and signs. Further than this it is impossible to go, and the fact remains that hydrosalpinx and hematosalpinx are more frequently undifferentiated than otherwise.

Pyosalpinx is always adherent and usually imbedded in lymph. It is quite often agglutinated to the contiguous structures. If it stands alone it may be definitely outlined as a thick-walled, boggy, tender mass. In shape and size it often bears a close resemblance to a sweet-potato. It is seldom that distinct fluctuations can be elicited. Quite frequently it is associated with ovarian abscess. It is to be differentiated from ectopic gestation, suppurating pelvic cysts, and pelvic abscess.

The physical characters of pyosalpinx and *ectopic gestation,* as elicited by examination, are almost identical, and one is frequently mistaken for the other. The indications of pregnancy, the rapid and

continued development, the fainting spells, and shredded, bloody discharges from the uterus would point to ectopic gestation, while the absence of these and the presence of fever from absorption of septic matter, together with the clinical history of the case, including the acute and exacerbation stages, would point to pyosalpinx.

Suppurating pelvic cysts of various kinds may be confounded with pyosalpinx, but the size, shape, and thinness of the walls of the cyst as compared with the pyosalpinx will usually suffice to distinguish them. As between pyosalpinx and *pelvic abscess,* the latter forms in the midst of infiltrations and lymph-beds, and, therefore, seldom has a definite body with definite shape.

Prognosis.—The prognosis as to life is not bad. In an extended experience embracing a period of many years I have known of but one death from direct extension of gonorrheal infection through the tubes into the peritoneal cavity. Streptococcic infection is much more dangerous to life, and yet the cases are comparatively few in which tubal infection even of this character terminates in death. Numerous cases occur in which the poison is distributed from focused points in or about the tube as the result of violence. Traction on the cervix, as in the minor operations of curettage and trachelorrhaphy, or even manipulation, as in massage or manual examination, have resulted in rupture of the sac and distribution of infection, and women have thus lost their lives who would have never succumbed to the disease had not Nature's barriers to further infection been rudely demolished by the hand that was intended to heal. No minor operations should be attempted on the uterus, no traction made on the cervix, nor rude efforts at palpation of the pelvic viscera indulged in in the presence of pus or other infectious fluids, or even when such are suspected. The aggravation of symptoms following these attempts is usually ascribed to irritation, but is, in fact, due to the escape of septic matter. The lives of professional prostitutes furnish corroborative evidence of the non-fatality of the purulent salpingitis if let alone. These women, as a class, are unalterably opposed to the unsexing operation for commercial reasons, and yet, despite the fact that their lives are one continual round of dissipation in utter disregard of all rules of life and health, few succumb to the disease. Many cases of the milder forms of salpingitis undergo perfect resolution. Others leave the tubes more or less crippled, and, last, the tubes may be so disorganized, bound down by adhesions, and pus-ridden as to entail more or less continual suffering and permanent invalidism.

Treatment.—The treatment of salpingitis is medicinal, electrical, and operative. In the acute stage, as also in the initial stage of the subacute form, the object would be to control inflammation, limit exudation, and prevent the distribution of infectious matter. This, in a very large proportion of cases, may be effected by rest and regulation of the bowels. The good that may be accomplished by prompt and scrupulous attention to these simple measures is incalculable. The disease will be limited in scope and intensity. As a result, the ravages of the disease amid the pelvic viscera will be greatly curtailed and structural changes in the tube itself reduced to the minimum. To be sure, there will be instances in which, despite of all, the infection will proceed unchecked: cases in which it will sweep unhindered through the tubes into the open expanse of the pelvis, over which it will spread like a consuming fire, but such instances are few as compared with the number in which timely and judicious management will avert the worst phases of tubal infection.

Fulminant attacks occur infrequently except in the puerperium, and it is seldom that any other will not yield to proper treatment so far as to tide over the acute stage. Many cases will recover entirely under this *régime,* while others will be so much improved as to render operative interference unnecessary. Where the disease has made such ravages as to necessitate operative interference, the time gained by the preliminary treatment will be invaluable to both patient and surgeon, as during such time germ-life will have become extinct, or enfeebled to such an extent as greatly to diminish the dangers of the operation. The principal bar to the accomplishment of the maximum of good in these cases lies in the fact that the physician is not called soon enough.

Promptly, at the first signal of trouble, the patient should be placed in bed and at rest. The rest should be absolute, and, if possible, every convenience contributing to that end should be provided. The patient should be unclad, placed in a comfortable bed with comfortable surroundings, and left undisturbed in the care of a competent nurse. After this the bowels should be cleared, preceded, if need be, by enemata to unload the rectum. For moving the bowels some form of saline is preferable, as by its use several indications are met. The bowels are unloaded and large quantities of fluid drawn from the tissues whereby the pelvic circulation is relieved, the pelvic tissues depleted, absorption stimulated, secretions unlocked, and indirectly exudation modified. Epsom, Rochelle, or Crab Orchard salts, given in broken doses of from ʒss-j hourly until five or six doses are

taken, will usually result in frequent and copious evacuations. This will be followed by a relief of suffering. After the first thorough cleansing of the alimentary canal, the bowels should be kept soluble without active purgation. Any mild laxative that is found most agreeable to the patient may be used for this purpose. The exhibition of the laxative should be timed so as not to interfere with the patient's rest at night, those of slow action being given at bed-time and the more active ones in the morning. The list may contain any of the salines mentioned above, the compound licorice powder, cascara sagrada; the aloin, strychnine, and belladonna pill; or any other drug or preparation that the patient may have found to be gentle and effective.

The food at this stage should be somewhat restricted in quantity and bland in quality. It would better be liquid, and in the form of strained soups, broths, and gruels. Occasionally one of the proprietary food preparations not too rich in the albuminoids, predigested or

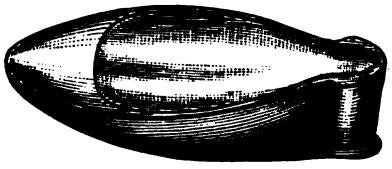


Fig. 235.—Improved Bed-pan.

malted, will be found to answer the purpose admirably. Vaginal discharges — either acrid, foul-smelling, or abundant — should be washed away by vaginal douche. The patient should be kept as quiet as is compatible with her comfort, and should not be allowed to get upon her feet, or even out of bed to attend the calls of Nature, recourse being had to the bed-pan. That she is not seriously sick renders these precautionary measures none the less imperative, as thereby serious sickness and possibly irreparable damage may be averted. The intelligent physician alone may estimate the value of his services in warding off more serious complications, for neither the patient nor her friends can be made to understand the situation. Nevertheless, no pains should be spared to impress upon them the gravity of the situation, nor in securing their full and free co-operation in carrying out the details of treatment.

Drugs for the relief of pain and producing sleep should be avoided so long as there is no urgent demand for them. Opiates are

especially harmful by locking up the secretions and inducing constipation. Nevertheless, there are cases which, from their intensity and persistence, demand such remedies. Phenacetin, codeine, or morphine may be tried in the order named. The morphine is better given hypodermically, as exhibited in this manner it disturbs the stomach less and is less constipating. Small doses at long intervals will usually suffice. Trional and sulphonal may sometimes be used to advantage for quieting nervousness and inducing sleep. Counter-irritants and derivatives applied to the cutaneous surface of the hypogastrium are sometimes used with apparent benefit. These consist of embrocations, hot-water bags, and blisters. Stupes and fomentations, while soothing, require unremitting care on the part of the attendant, and are, therefore, not always eligible. Poultices and the greasy preparations, such as lard and turpentine, so popular with the laity, are filthy and germ-breeders, and should be eschewed save under very exceptional circumstances. The hot-water bag is not open to these objections. Blisters to the hypogastrium frequently give much relief, but leave a raw surface, which interferes with examination and might prove a serious obstacle to operative interference; but the application of the adhesive rubber dam to the surface would, in large measure, obviate any evil results from this cause. A hygroscopic earthy preparation, such as is sold under the name of "antiphlogistine," may be advantageously substituted for some of the above-mentioned applications. These external applications, while of limited value, serve to reassure and satisfy the patient, and relieve the tedium of confinement by impressing her with the belief that everything possible is being done for her.

Later, when the more acute manifestations of the disease have subsided and there is less danger of disturbing the relations of the tube, the systematic use of vaginal douches may prove of great benefit by driving the blood from the pelvis and stimulating absorption of the inflammatory products. For this purpose they should be hot, copious, and prolonged, and should be administered with careful regard to certain details, which are essential to their efficiency. The primary effect of heat on the tissues is to increase the volume of blood; the secondary effect, to drive it out by diminishing the caliber of the vessels. The blanched and shriveled hands of the washerwoman after long immersion in hot water furnish familiar evidence of this fact. The water, therefore, should be as hot as can be borne with comfort, and its contact with the tissues maintained for a considerable length of time. A temperature of 110 degrees has been

found best; a gallon of water, about the proper quantity; and fifteen minutes, about the length of time the douche should be continued. This is all accomplished by placing the patient on her back with a douche-pan under her, and hanging the reservoir of the syringe at an elevation not to exceed two or three feet above the level of the body. The water flows into the vagina gradually, distends and balloons it, and escapes at the vulva. The inflow and outflow are so timed that without an undue waste of water the temperature is maintained at the maximum, and this, with the quantity in the reservoir, can be kept up from fifteen to twenty minutes. Meantime the effect of the sustained heat on the pelvic circulation is most beneficial, in that it drives the blood from the pelvis, constringes the vessels, abates inflammation, and conduces to absorption of exudation. This may be repeated from one to three times a day according to the exigencies of the case. The nozzle of the syringe should not be of metal or of any heat-conducting material, lest the patient be seriously inconvenienced by its contact with the vulva. Vulcanized rubber is best for the purpose.

To promote the absorption of exudates and restore the pelvic circulation to its normal equilibrium, local treatment will frequently prove of great benefit. It should not be resorted to until the acute stage has passed and the inflammatory process has assumed a low grade. This will be indicated by the subsidence of pain, tenderness, and fever. The vault of the vagina, including the cervix, may be painted once a week with tincture of iodine and a tamponade of lamb's wool or cotton saturated with boroglycerid placed in the vagina. The tampon should be removed at the expiration of twenty-four hours and replaced every alternate or third day. Hot vaginal douches should follow the withdrawal of the tampon, and repeated as often as may be deemed necessary. If the cervix be swollen and turgid, the occasional abstraction of a few ounces of blood from it by deep puncture will be of benefit. This will seldom be required oftener than once a week or once in two weeks, nor should it be repeated too often. A gentle douche of warm water will encourage the bleeding, which is apt to be scant. A 10-per-cent. solution of ichthyol in glycerin, applied on a tampon to the vaginal vault, is of apparent utility in promoting the softening and absorption of exudates. As a sorbefacient it stands easily first in professional favor. Fresh air, judicious exercise, proper diet, and regular habits are all important factors in the treatment. In the absence of pus *massage* is of undoubted efficacy in promoting absorption and liberating ad-

hesions. But before this is resorted to the absence of pus in the pelvis should be accurately determined, lest serious damage ensue. The liberation of sterile pus would, of course, be much less harmful than that of recent infection. As one can never be quite sure that pus does not exist, especially in connection with the grosser structural changes, it is safe to defer massage until the pus shall have had reasonable time for sterilization.

CHAPTER XXX.

ELECTRICAL AND SURGICAL TREATMENT OF SALPINGITIS.

Electricity.—There are good and apparently sufficient reasons for believing that electricity properly handled in judiciously selected cases may be of great benefit in promoting the absorption of exudates. That it is capable of stimulating physiologic metabolism, and thereby indirectly conducing to the absorption of inert or lowly organized plastic matter, admits of no doubt. Unfortunately, it has its limitations, and requires a most intimate knowledge of its properties and their relation to pathologic conditions to render its use beneficial or even safe. The contra-indications for its use in pelvic troubles are active inflammation and the presence of pus. By common consent, it should not be used under such conditions, and yet Massey uses the faradic current in the height of inflammatory reaction as a soothing and palliative measure. He uses the vaginal bipolar electrode at the bedside, and exercises extreme caution and gentleness in turning on the current and gauging it to the patient's feelings. The *séances* are continued for fifteen minutes. It soothes and pacifies the patient, annuls pain, and conduces to refreshing rest. The application is repeated daily.

For more advanced cases, where the active symptoms have, in a measure, subsided, the constant current is used. One pole (the negative) is introduced into the vagina or uterine canal, and the other applied to the surface of the abdomen. The electrodes are fashioned according to the uses for which they are intended, the vaginal being large and spherical, and the uterine of a size and shape to adapt itself to the uterine canal. Some of the latter are made flexible to admit of easy and painless introduction. The abdominal or indifferent electrode is expansive, being from five to eight inches in diameter, and molded to conform to the shape of the abdomen. It consists of a metal plate or disk covered with clay, cotton, spongiopiline, or some other absorbable material, which is moistened to increase its conductivity. This distributes the current over a large surface and enables the patient to endure a much stronger current than would

otherwise be tolerable. The vaginal electrode is first used with a measure of from 30 to 50 milliampères, the *séances* lasting from three to five minutes, according to the tolerance of the patient. This may be repeated once or twice a week and continued so long as satisfactory results are obtained.

Later, if need be, the uterine electrode may be brought into requisition. This part of the treatment should be approached with the utmost care, and should be tentative, to be desisted from, suspended, or modified upon the first indication of unfavorable reaction. Rashness here may precipitate a recrudescence of the disease in all its initial fury, or even inaugurate new evils more damaging and dangerous than the original attack. Massey, while recognizing the delicacy of the undertaking, does not hesitate, on occasion, to attack pus cases through the intra-uterine application. He used the flexible electrode, which is introduced with the utmost gentleness only part way up the canal, advancing little by little with each *séance,* according to the effect on the patient. The *séances* at first are of short duration, not exceeding three minutes with a mild current. In the absence of unfavorable results the strength of the current is increased and the intervals between them diminished. In old and intractable cases, not refractory to intra-uterine application, cataphoresis is recommended. Here the positive, mercuric-coated, copper electrode is introduced into the uterine cavity and the negative placed over the abdomen. The distribution of the cupric-mercurial salts in the path of the electric current produces an alterative action and conduces to the absorption of exudates.

Operative Treatment.—Operations for the relief of the inflammatory affections of the Fallopian tubes are ranged under two heads: conservative and radical. Conservative operations have for their object the preservation of the organs, and, in so far as possible, the restoration of anatomic integrity and functional activity.

Radical operations have for their object the relief from suffering and the restoration of health by removal of the offending organs.

When and how to operate are questions not easy of solution, as the conditions are so variable and are influenced by such an infinitude of modifying circumstances. Consequently, no hard and fast rules can be laid down for the guidance of the surgeon. Nevertheless, there are certain general principles which, if judiciously made use of, will go far toward solving the question. Unquestionably, of late years, the tendency has been in the direction of too much operative interference. With the improvement in technique and the low rate

of mortality attending pelvic and abdominal operations, coupled with the immediate relief from distressing symptoms, both patient and surgeon are prompted to early recourse to that method which offers the most direct results.

The ulterior results of these operations are not given the consideration that their importance demands. Furthermore, pelvic surgery has a mortality of its own, and the indiscriminate resort to operative measures on every pretext will swell the mortality list far beyond that which would accrue from the disease. The natural history of tubal disease as deduced from the ante-operative era, and as may be verified now by observation of cases treated expectantly, fully bears out this view. Albeit operative interference in properly selected cases is essential to the best results, and is a priceless boon to womankind.

It may be laid down as a rule to which there are few exceptions that operative interference of any kind is seldom called for in the acute stage of the primary attack. Especially does this apply to gonorrheal infection. Occasionally in streptococcic infection the advance is so rapid that the question resolves itself into immediate operation or death. Unfortunately, the result here is too often operation *and* death, as the poison is so fleet-footed, subtile, and deadly as to outrun and elude the surgeon and defy restraint. One of the most comforting assurances the physician can have in streptococcic infection is the swelling of the tubes and the matting and massing of the pelvic viscera. It indicates that the poison is traveling by way of the tubes, and is not being distributed broadcast through the lymphatics. It indicates, furthermore, that the poison has been entrapped, and that it will not escape unless liberated by violence or meddlesome surgery. In violent infectious disease of the pelvis I always hail with satisfaction tubal infiltration and plastic exudation as harbingers of safety to my patient. In other words, pelvic adhesions in the active stage of pelvic infection should be regarded with friendly interest and fostered as the best possible safeguard against general infection.

Especially hazardous is surgical interference where the exudation is vaulted into the abdominal cavity. Here the tubes must be reached through coils of agglutinated intestines, exposing an extensive area of germ-infested surface in the most vulnerable part of the peritoneal cavity. True, there are surgeons who operate regardless of time or condition, and it must be admitted that in many instances their results are all that could be desired; still, such will pay for their temerity in an unwarrantably large death-rate, which is all the more

deplorable because unnecessary. Good judgment and fine discrimination may enable the surgeon to select cases for operation even in the acute stage without materially affecting the death-rate, but these qualities cannot be communicated, nor in the absence of which can the practice be imitated with safety.

Time and patience, with a judicious use of the measures already indicated, will, in many instances, bring about the subsidence of inflammatory reaction, and, more frequently than is generally supposed, lead on to a symptomatic, if not actual, cure. Yet, after all, there will be cases demanding surgical relief, which under this *régime* will be taken at the most opportune time to secure the best possible results, and the conscientious surgeon will experience much gratification in the knowledge that only the essentially surgical cases have been included in the category. An exception to non-operative interference in the early stages of infection may sometimes be made in favor of curettage of the uterine cavity. Where there is reason to believe that some of the products of conception have been retained, these should be dislodged either with the finger or curette, and washed out either with sterilized water or a mild antiseptic solution. Later, in any form of infection when the disease has become comparatively quiescent, but with little or no tendency to resolution, curettage by removing the source of infection will often prove of decided benefit. Pus in the pelvic cavity would, of course, be a positive contra-indication to curettage unless it is to be followed by immediate abdominal section. All operations on the tubes themselves, whether radical or conservative, should be accompanied by curettage of the uterus.

If after ample time and opportunity, and in spite of the non-operative measures (including curettage, if deemed necessary) the disease prove intractable, resort may be had to more heroic measures. Exceptions to these dilatory tactics may be made in the case of pus-tubes. While pus-tubes may, and sometimes do, undergo changes by which they cease to harass the patient, they are, as a rule, long-lived fomenters of mischief, entailing so many restraints on daily pursuits and pleasures as to justify interference at the earliest possible moment compatible with safety. The social state of the patient may also demand early operation. The busy house-wife or wage-earner, compelled by necessity to be up and doing, cannot await the slow process of restoration in its natural course, nor yet avail herself of the rest and means by which this may be expedited, hence she is compelled to accept the quickest and surest means of relief from an infirmity which stands between her and her daily bread.

As between radical and conservative operations on the uterine appendages, the question often resolves itself into one of expediency. Usually pus-tubes and tubes which have undergone marked degenerative changes are not amenable to conservative treatment, and should be removed. Occasionally tubes which are not so greatly damaged may be so treated as to relieve suffering and in some instances restore function. Adhesions may be broken up and the tube liberated, unfolded, and restored to its natural position. The fimbriated extremity of the tube may be unsealed, and on rare occasions the fimbria unfurled. The tube may be incised in places here and there, the contents removed, and its caliber restored by the use of the knife and probe. When it is impossible to restore the fimbriated orifice, a new ostium may be formed by excising the sealed extremity of the tube and stitching the edges of the mucous and serous coats together, or by incising the tube at the most eligible point (usually near the distal extremity and in proximity to the ovary) and suturing the mucous to the serous coat.

The results of such operations have sometimes been brilliant. The patient has been relieved from suffering, and the functions of the tube restored. Pregnancy has followed the opening of the lumen of the tube, even through an artificial ostium. Still, it must be conceded that conservative operations on the Fallopian tube are too often, if not in the main, disappointing. Many such cases, after a longer or shorter period of expectancy and unabated suffering, again repair to the operating-table to have the offending organs removed. Conservative operations on the Fallopian tubes, as already intimated, are usually limited to such cases as offer a strong probability of relief or of restoration of function. Occasionally a patient will be willing to take the chances of continued invalidism or a secondary operation rather than to part with the essential organs of generation. Anxiety for a child is usually the motive which prompts such a course. Under such circumstances the surgeon is justified in taking chances that would otherwise be unwarrantable.

The question frequently arises as to whether both appendages should be removed when the disease is apparently confined to one. Long experience has taught that gonorrheal infection almost invariably attacks both tubes—usually one after the other, and the removal of one side will sooner or later be followed by disease of the other, oftentimes demanding a second operation. In view of this fact, it is better to remove both tubes at the same sitting, even though one is to all appearances perfectly healthy. Streptococcic infection is,

however, usually confined to one side, and shows little disposition to involve the other. Here only the diseased tube should be dealt with. Hydrosalpinx and hematosalpinx are usually harmless; their mere presence, unaccompanied by distressing symptoms, is, therefore, no justification for their removal unless section has already been made for other cause or under mistaken diagnosis.

SALPINGO-OÖPHORECTOMY.—This is the name applied to the operation of removal of the Fallopian tubes and ovaries. The two organs are usually removed simultaneously, for the reason that they are so intimately associated anatomically and so correlated physiologically and pathologically that one is seldom seriously affected to the exclusion of the other. Occasionally it is found expedient to remove the tube alone. This is called salpingectomy.

After the usual abdominal incision between the umbilicus and pubis, two fingers of the left hand are introduced into the opening, palmar aspect forward. This position of the fingers should, as a rule, be maintained throughout. The tips of the fingers are first applied to the parietal peritoneum at the lower angle of the incision, and glided downward and backward over the bladder to the uterus, which is the landmark by which the appendages may be located. Gliding the fingers outward from the posterior aspect of the uterus, the appendages are located and the adhesions—if any exist—broken up, first on one side and then on the other. The ovary and tube of one side are lifted up and brought out through the incision, either upon or between the fingers, or, if necessary, aided by the thumb.

The next step is the ligation of the vessels. The first ligature is placed near the pelvic wall, and is passed through the thin, transparent portion of the infundibulo-pelvic ligament beneath its thickened border, through which the ovarian vessels course. This thin portion of the ligament can be pushed forward on the tip of the finger and the ligature carrier pushed through it under the eye, thus avoiding the puncture of any small vascular branch. After tying this ligature another is inserted near the uterine cornu so as to include the Fallopian tube and the vessels beneath it. (Fig. 236.) Here the same precautions should be taken as before to avoid puncture of branch vessels.

After tying this ligature, the mass, including the tube and ovary, is lifted up and cut away, care being taken not to cut too close to the ligatures lest they should slip. Before complete severance of the mass it is well to catch up the ligament at either extremity with clamp forceps to prevent retraction. Some operators use the ligatures for

this purpose, but the practice is a dangerous one, as traction on the ligature may result in partial displacement, which, not being observed, may result in secondary hemorrhage after the abdomen is closed. If the ligatures are well placed, there will usually be no hemorrhage from the raw edges of the broad ligament between them. Should any bleeding points exist, they may be ligated with fine catgut, or controlled by an over-and-over suture of catgut run from one end of the stump to the other. In case both sets of appendages should require removal, the same technique would apply to the opposite side.

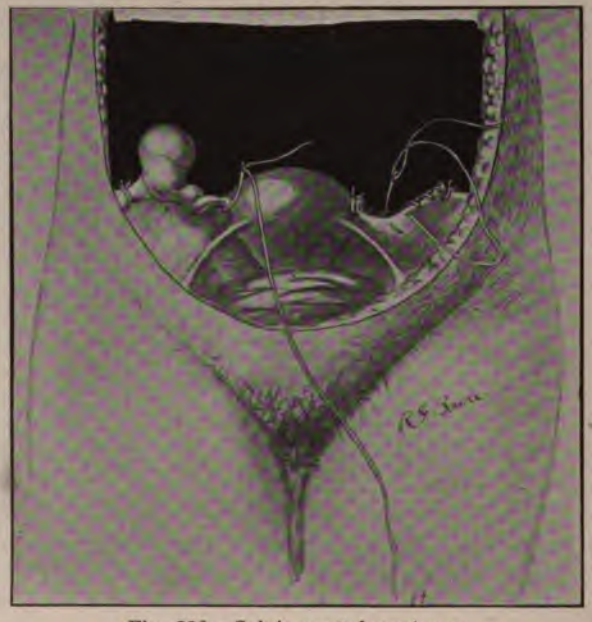


Fig. 236.—Salpingo-oöphorectomy.

The right tube is being ligatured preparatory to removal. The left tube has been removed and the broad ligament is being closed by a running catgut suture.

A more expeditious, but far less safe, method of ligaturing the appendages is to transfix the base near the center with a double ligature, give them a twist around each other so as to interlink them, and tie each half of the pedicle separately. As an additional precaution, the ends of one of the ligatures are brought back so as to encircle the whole pedicle and again tied. By this method it is essential that the pedicle should not be put on the stretch by traction on the appendages at the time the ligatures are being tied, lest retraction

of the stump should ensue, with consequent displacement of the ligature. It is equally important that a good button should be left beyond the ligature. There are several objections to this method, the chief of which is that by the crumpling of the broad ligament at the site of ligation the ligature is located at the apex of a cone: a very dangerous position. Another is that the tension on the broad ligament is often so great as to occasion much suffering, both during and after convalescence. The Tait knot is even more dangerous, and should never be employed by one not schooled to its use.

After securing the pedicle and cleansing the cavity by sponging or irrigation, account should be taken of the sponges and instruments to be sure that none is missing. Before closing the incision the omentum should be drawn down so as to interpose between the intestines and the line of incision. This will prevent intestinal adhesions to the abdominal parietes along the line of incision.

COMPLICATIONS.—An adherent omentum may have to be separated before access can be had to the appendages. Injuries to the omentum should receive immediate attention, as the bleeding is apt to be persistent, and, if not looked after immediately, may elude detection. Firm and extensive adhesions of the tubes and ovaries may prove very annoying, and their liberation is sometimes a matter of great difficulty as well as danger. Misdirected efforts in such cases are very apt to result in failure or disaster to the patient.

Not infrequently a formless mass will be found occupying the pelvis, which will be very puzzling to the inexperienced, there being apparently no landmarks and an effacement of all lines of demarkation. Such masses seem to be covered by peritoneum in no way distinguishable from and apparently continuous with the general peritoneum. When encountering such it should always be remembered that there is a seam somewhere, which if found and followed will result in the complete enucleation of the diseased appendages. This seam is known as the line of cleavage. The initial and most important step is to locate the line of cleavage. Gentle pressure with the tips of the fingers at some point along this line will usually result in the separation of the tissue. Into this opening one or two fingers are thrust. A start being made, the line can usually be followed by pressure, first in one direction and then in the other, until complete separation is effected. This line will usually be found deep down in the pelvis and well back toward the hollow of the sacrum. Blind force should never be used at any stage of this most delicate and important part of the operation. A false passage, once formed, will

lead to almost inevitable failure and disaster. Under such conditions a large incision and the Trendelenburg position are of great benefit to the less experienced operator, as thereby he may have the assistance of his eyes. It occasionally happens that after following the line for a variable distance it becomes lost. Here, by delving deep into the crevice and hooking the fingers forward and upward the mass may be rolled out of its bed. This maneuver should not be lost sight of, as it is often the key to success. In all these maneuvers the palmar aspect of the fingers is applied to the mass which is under process of enucleation.

Occasionally the appendages will be found perched upon the fundus, or occupying the vesico-uterine space. In every case where there is the least reason to suspect pus, provision should be made to prevent soiling of the peritoneum by the proper disposal of pads and sponges. If a pus-cavity be opened during the process of enucleation, the pus should be received on sponges, which are immediately discarded, and not to be used again. Hemorrhage from the raw surfaces is sometimes quite free, but is seldom persistent. Temporary packing of the cavity while attention is given to other details of the operation will usually suffice to arrest it. Should the oozing continue, a long strip of gauze may be packed in and the end brought out at the lower angle of the incision. This will serve the double purpose of a tampon and drain, and may be allowed to remain from one to three days, as may be deemed advisable.

CHAPTER XXXI.

TUBERCULOSIS OF THE FALLOPIAN TUBES—PELVIC CELLULITIS.

TUBERCULOSIS OF THE FALLOPIAN TUBES.

TUBERCULOSIS of the Fallopian tubes is more frequent than that of any other portion of the genital tract. Under the improved method of modern investigation tuberculosis is found to be the basic factor

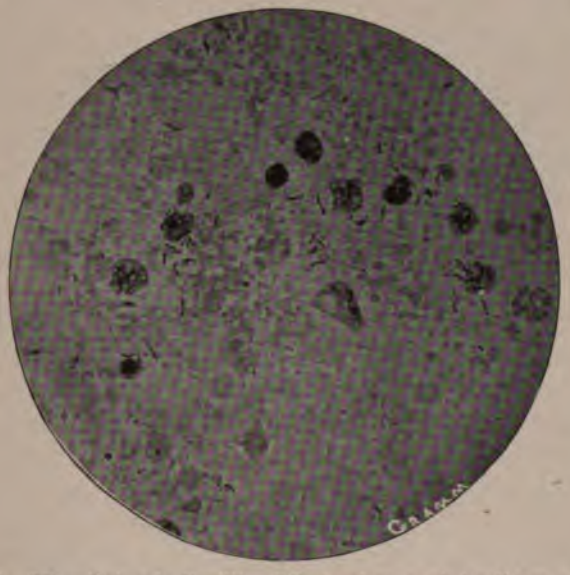


Fig. 237.—Tubercle Bacilli. (Photomicrograph by Gramm.)

of many morbid processes that have hitherto masqueraded under other names. Tubercular infection of the tubes may be primary or secondary. In by far the larger proportion of cases it is secondary. Primary infection, as a rule to which there are few exceptions, comes by way of the genital canal, the germs being introduced on fingers, instruments, and contaminated clothing. Probably the most common medium of infection is through sexual intercourse, the germs being

carried up the genital canal by the spermatozoa. That the germs cling to and are transmitted by the spermatozoa finds plausible support in the fact that tubal tuberculosis occurs most frequently in the woman of active sexual life, and, furthermore, by the oft-repeated demonstration of the tubercle bacillus in the testicle and testicular fluids of phthisical men. It is also found in the gonorrheal discharges of such.

The presence of the tubercle bacillus in the substance and secretions of the genital organs of the male does not necessarily imply infection of the organs which harbor them, as in many instances the organs themselves are sound. The tubercle bacillus may infest a part without infecting it. It may spread over a raw surface, traverse the lymphatic or blood channels to remote parts, or, as has been seen, swarm in the secretions of a glandular organ without infecting the tissues with which it is brought in contact. In other words, it will often pass over and through tissues to find a congenial soil in which to luxuriate and work out its characteristic pathologic results. A familiar example of the elective affinity of the tubercle bacillus is found in pulmonary tuberculosis, in which the germ must have passed the nose, mouth, and throat in order to fasten upon the lung.

There can be no reasonable doubt but that in primary tuberculosis of the Fallopian tube the germ in most instances finds its way to the tube through the natural genital passages. There are reasons for believing that in some instances it takes the lymphatic route from some raw surface on the vulva or vagina, as evidenced by the fact that it locates in that portion of the tube—the distal—which is in line with the lymphatics having their origin in the lower genital tract. It has been supposed that the blood sometimes acted as the carrier of the germ from a more or less remote point of inception, but this, in the light of recent experimental research, is quite improbable. Lasker, in a series of tests to solve the question as to the presence of bacteria in the blood in cases of pulmonary tuberculosis, found the blood sterile in 67 out of 68 cases, and, inasmuch as the patient in whom the bacteria were found died in 19 hours, he attributes the presence of germs in that case to agonal disjunction.

Secondary infection of the Fallopian tubes is not only much more frequent than the primary, but also in most instances travels a different route. The primary infection with great uniformity travels from below upward, whereas the secondary infection very generally pursues a course from above downward. Secondary tubal infection in the vast majority of cases arises by continuity from tubercular peritonitis. Infection of the tube may be communicated from any of the

tuberculous pelvic or abdominal organs with which the tube is in contact or to which it is adherent. The known fact that the tubercle bacillus can pass through the walls of the ulcerated intestine into the general peritoneal cavity, taken in connection with the experimental researches of Pirmer, who demonstrated that fine particles of matter, as of cinnabar, introduced into the peritoneal cavity soon found their way into the Fallopian tube through the ostium abdominale, leaves little doubt but that tubal infection may occur from an intestinal tuberculosis. The same rule would doubtless apply to tuberculous ulcer or abscess of any of the organs abutting upon the general peritoneal cavity, which would greatly multiply the opportunities of secondary infection of the tubes. Excreta from the tuberculous intestine sometimes act as the vehicle by which the germ is conveyed to the vulvar cleft, from whence it ascends through the genital canal. The

Fig. 238.—Tuberculosis of the Fallopian Tube.
The left tube is studded with tubercles. Hydrosalpinx is shown on the right side.

transfer may be made through the instrumentality of soiled fingers or clothing. And, finally, here, as in primary infection, the lymphatics may convey the germs from more or less distant focal deposits to the Fallopian tube.

Symptoms and Course.—Tubal tuberculosis is usually bilateral. It occurs under two forms: 1. As a well-marked lesion with obvious tubercular deposits. 2. In a masked form, in which the tube presents no tangible lesion.

In the first form the appearance of the tube is very much like that of salpingitis from other causes, and is subject to almost infinite variety. Added to this in most instances, miliary tubercles are found in greater or less abundance studding the surface of the tube. (Fig. 238.) Not infrequently nodular masses of tubercular deposit and the fibrous formation incident to the same are to be found projecting from the surface of the tube. These are prone to assume a bead-like arrange-

ment along its course, constituting the rosary-shaped tube of Hegar. (Fig. 239.) This is quite characteristic of tubal tuberculosis, and when present is of diagnostic value. The fimbriated extremity is quite often occluded and the lumen of the tube filled with liquid, creamy, or caseous matter. This represents the mixed products of disintegration and inflammatory exudation, and is seldom purely purulent. Primary tuberculosis is usually of tardy development and is inherently chronic, whereas the secondary form is characterized by greater activity and earlier manifestation of gross lesion. The former, coming as it does by way of the genital canal, first encounters and affects the isthmus of the tube. This, in many instances, gives rise to a characteristic enlargement of the isthmus, most pronounced at the uterine extremity and tapering as it proceeds outward. This enlargement sometimes forms a distinct shoulder at its junction with the uterus, at others appears as a prolongation of the uterine cornu,

Fig. 239.—Tuberculosis of the Fallopian Tube.
On the left is shown the shoulder-like enlargement of the isthmus and on the right the rosary-like tube.

and is regarded by Hegar as almost pathognomonic of tubal tuberculosis. (Fig. 239.)

The tubercle bacilli, as they enter the tube from the uterine cavity, are brought in contact with and not infrequently confine themselves to the mucosa and its immediate environment. In many instances the tube suffers no palpable lesion for a very considerable period. Such tubes are habitually overlooked, both in operation and autopsy. These, which form no inconsiderable proportion of tubercular tubes, constitute the masked form referred to above. They are classed by Williams under the head of "unsuspected tubal tuberculosis." Gradual and progressive involvement and destruction of the mucosa, with accumulated *detritus* in the lumen of the tube, and infiltration and thickening of the tube-walls, is the usual order of sequence. Some cases are characterized by a marked and progressive increase in the fibroid elements of the tube-wall, as the result of

bacterial stimulation, until the tube becomes of almost cartilaginous consistence. Calcareous infiltration of the tuberculous foci is occasionally observed. Both fibrous and calcareous degenerations are conservative, and may result in spontaneous cure. In advanced tubal tuberculosis we find peripheral extension, adhesions to the omentum and contiguous viscera, encysted fluid and purulent accumulations in the midst of the same, and almost limitless variations in the size and shape of the tube.

Diagnosis.—In a very large proportion of cases the symptoms are in no wise distinctive. As a matter of fact, the diagnosis is seldom made until the tubes have been cut down upon. If the patient is the subject of a pulmonary or other recognized form of tuberculosis, if she gives a family history of tuberculosis, or if her husband is tuberculous, tubal lesion otherwise unaccounted for might very justly be suspected of being tuberculous in character. The shoulder-like enlargement of the isthmus at the uterine end and nodular formations along the course of the tube, when detectable by palpation, are valuable data upon which to base a diagnosis. In the same line Osler places stress upon an enlargement of the tube with an ill-defined, anomalous mass in the abdomen. On several occasions I have made the diagnosis in the absence of appreciable enlargement of the tube based upon a persistent tenderness in the vicinity of the tube and an unconquerable rigidity of the abdominal muscles. Probably the most trustworthy indication of tubal tuberculosis, where the signs are not distinctive, is the persistent and progressive character of the trouble. Finally, the presence of the tubercle bacillus in the scrapings from the uterine cavity or in the aspirated fluids of the tube would render the diagnosis almost certain.

Prognosis.—The natural tendency of tubal tuberculosis is to extend, to distribute infection, to undermine health, and to destroy life. Surgical interference in cases of primary infection will usually suffice to stamp out the disease. In secondary infection, when not too far advanced nor seriously complicated with other foci of infection, it retards the progress of the disease and prolongs life.

Treatment.—The only treatment of any avail is to remove the affected tubes with or without hysterectomy. In a surprisingly large number of cases removal of the tubes alone, even in the presence of obvious involvement of the uterus, has resulted in cure. Where the uterus is not removed it should be curetted. Peritoneal involvement is no contra-indication, but rather an additional incentive to operation, as the mere opening of the abdomen has a most salutary effect on

tubercular peritonitis. Advanced pulmonary phthisis and general tuberculosis are positive contra-indications, unless the local conditions are such as to produce more wear and tear than would result from the operation. The operative treatment should be supplemented by such other measures, medicinal and hygienic, as are applicable to tuberculosis and the condition of the patient.

PELVIC CELLULITIS.

Before the advent of abdominal surgery pelvic cellulitis, or inflammation of the pelvic cellular tissue, was credited with a large proportion of the inflammatory conditions of the pelvis. We now know that pelvic cellulitis is comparatively rare, and that a large majority of the inflammatory affections of the pelvis take their origin in the Fallopian tubes. Nevertheless, pelvic cellulitis is a factor—and, by reason of its course and consequence, a very important factor—in the inflammatory affections in the pelvis. The essential cause of pelvic cellulitis is, in the vast majority of cases, streptococcic infection. Other micro-organisms are capable of producing it, notably the staphylococcus and the bacterium coli, but comparatively seldom do so, for the reason that they are not active invaders and are not so likely to be introduced through accident or carelessness. It never arises from gonococcic infection, and consequently pelvic cellulitis does not, as a rule, complicate gonorrheal salpingitis, as claimed by some writers. Pelvic cellulitis is, furthermore, most frequently associated with the puerperal state: in most instances follows an abortion or labor at term. The history of the case will, therefore, furnish an important clue to the nature of the affection.

The invasion is in most instances by way of the lymphatics. Very infrequently the germ may make its way through the thrombus into the blood-current; may follow the genital canal up through the tube, or pass directly through the tissues. The route of invasion is usually along the layers of connective tissue or fascia of the pelvis to which the pathologic changes are confined. Consequently the affection is not diffused and uniform throughout the pelvis, but is confined to certain strata, and extends in certain directions to conform to the layers of connective tissue. As the germ gains entrance through some lesion of the genital tract,—an abrasion or laceration of the lower portion of the canal or cervix, or the *locus* of placental implantation in the uterus,—it follows that the line of invasion of the cellular tissue is from this pivotal point in some one or other direction. (Fig. 240.)

In by far the larger number of cases it follows the cellular tissue between the folds of the broad ligament, and is almost invariably unilateral. Occasionally it will be found in the cellular tissue in front of or back of the uterus or in more remote parts. The effect is to bind the uterus firmly to the pelvic wall.

The chief characteristic of the exudation of pelvic cellulitis is the great density imparted to the infiltrated area. This is at first rather soft and edematous, but soon assumes a stony hardness and an absolute immobility which is quite different from the bogginess of the inflamed tubes.

The tendency of the infiltrated cellular tissue is to suppurate. The suppuration is apt to occur at various focal points, which may coalesce or remain distinct throughout the course of the disease. Sup-

Fig. 240.—Pelvic Cellulitis.
The dotted areas indicate the various directions in which it may extend.

puration of the pelvic cellular tissue, once inaugurated, is very liable to continue indefinitely unless arrested by surgical intervention. Suppurating pelvic cellulitis is usually denominated pelvic abscess. This term is, however, generic, and embraces a number of pathologic processes in the pelvis characterized by the formation of pus. It is applied to pyosalpinx, suppuration of the lymph-beds around the inflamed tube, ovarian abscess, and to the suppurating hematoma and hematocele. The pus, in suppurating cellulitis, seeks an outlet through the bowel, bladder, rectum, vagina, and abdominal wall. Not infrequently it finds exit through a long and tortuous passage and continues to harass the woman during the period of her natural life. These fistulæ add greatly to the discomfort of the patient and to the difficulties and dangers of operation for her relief. When the pus approaches the peritoneal surface, its rupture into the cavity is fore-

stalled by an embankment of contiguous viscera agglutinated by plastic exudation. By this means the catastrophe of an immediate fatal peritonitis is averted.

The streptococcus finds a particularly congenial soil in the pelvic cellular tissue, and its tenure of life in this situation is sometimes remarkable. Ordinarily it will have run its course within from two to twelve weeks, but Miller, of the Johns Hopkins Hospital, cites an instance in which cultures were made from germs that had apparently survived the initial infection over twelve years and another in which a fatal peritonitis induced by them followed an operation two years after subsidence of active manifestations of the disease. Fortunately, such longevity is not often met with, but, unfortunately, there are

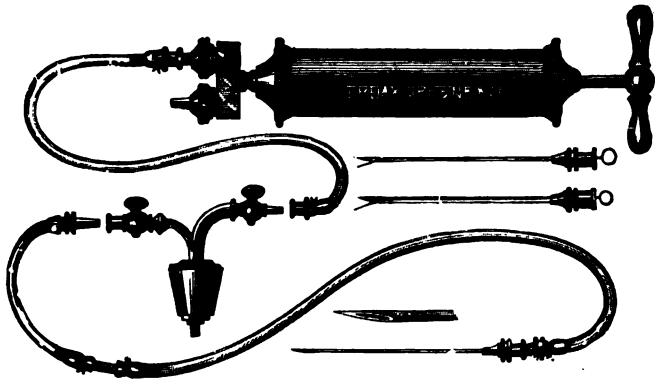


Fig. 241.—Potain's Aspirator.

no means of determining this fact except by control tests with the matter itself.

The diagnostic criteria by which a pelvic cellulitis may be recognized are the history of infection, usually dating from a miscarriage or labor; the solidity of the infiltration; its one-sidedness with reference to the uterus; the fixidity of the latter, and the extension of the infiltration from the uterus to the pelvic wall. Suppuration of the mass is almost never attended by fluctuation, but can be predicated with almost absolute certainty by the stony hardness, which indicates a stage of advancement in which pus is almost always present.

Treatment.—The gravity of pelvic cellular abscess, its persistence, the distressing consequences of fistulous opening into some of the hollow viscera, and the possibility of rupture into the peritoneal cavity, with its inevitable fatal result, call for prompt and positive in-

terference. Surgery offers the only rational and certain means of relief. The abscess should be attacked through the most direct route compatible with safety. In all cases it should be the aim to avoid, if possible, the peritoneal cavity.

If it can be reached through the vagina an incision should be made through the mucous membrane over the most prominent point, and the dissection continued with the finger or blunt instrument until the pus-cavity is reached. Great care should be exercised not to injure the ureter or important blood-vessels in the vicinity. Some operators prefer to locate the pus with an aspirating needle, and to follow its track with a pair of sharp-pointed scissors, a perforating forceps, or other like instrument, and to enlarge the opening by expanding the blades. If the abscess is located at the base of the broad ligament, an opening made back of the cervix close to the affected side will usually enable the operator to break through the intervening tissues with his

Fig. 242.—Rubber Drainage Tube.

fingers and reach the pus-cavity without jeoparding important structures. This course should always be pursued when practicable.

An abscess located in the vesico-uterine cellular tissue may be reached in front of the cervix. The superficial abscess will sometimes be easier to reach through the abdominal wall, the incision being carried just above and parallel to Poupart's ligament, and the dissection carried down outside the peritoneum. The abscess once reached, the cellular tissue should be thoroughly broken up, the *débris* washed away, and a drainage tube inserted through which the cavity should be irrigated once or twice daily until the cavity is practically obliterated. In case of doubt as to the involvement of the ovaries and tubes,—a contingency by no means rare,—an exploratory section should be made to clear up the diagnosis, as any operation not including their removal where they are grossly diseased would not only be futile, but prejudicial to the patient. If it should be found necessary to operate through the abdomen, every precaution should be used to

avoid contamination of the visceral or parietal peritoneum or the wound surface by properly adjusted pads and careful manipulation. Should the appendages be found healthy, the abdominal incision should be closed and the operation conducted extraperitoneally.

OPERATIONS THROUGH THE VAGINA FOR PELVIC INFECTION.

Vaginal Hysterectomy.—Many surgeons are in the habit of removing the uterus through the vagina in bad cases of pelvic infection, claiming for the operation less danger and greater efficiency than attend operations by the abdominal route. They base their claims on the more effective drainage through the vagina, greater safety to the patient in that the protective arch which interposes between the infected area and general peritoneal cavity is not broken through, and the diminished shock from non-interference with the intestines. They furthermore claim that even where the adnexa cannot be removed the drainage is so perfect that the infection dies out and in most instances a permanent cure results.

Operation.—The instruments needed are a knife, a pair of long-handled scissors curved on the flat, three traction forceps, four perineal retractors, a small Péan retractor, four broad ligament forceps, and several hemostatic forceps. The retractors being introduced, the cervix is seized with traction forceps, and an incision made in front from side to side, being careful to avoid the vesical wall. A similar incision is made behind, but not so close to, the cervix. From the junction of these incisions a linear incision three-fourths of an inch in length is carried outward on either side along the base of the broad ligament. This imparts greater mobility to the uterus, and when drawn to one or the other side increases the distance between it and the ureters. With finger and scissors the cervix is freed from the bladder, a retractor being inserted into the opening, which greatly facilitates the process. In like manner the cervix is freed from behind. Forceps are now applied to the broad ligament on either side so as to include the uterine arteries, and the portion thus secured cut through, keeping close to the uterine wall. The side retractors may now be dispensed with, the forceps taking their place. The cervix is next split up on either side and the posterior half amputated. The anterior half is also amputated, but before complete severance a new hold must be taken by the forceps on the anterior uterine wall above. From this time on the operation consists in dissecting off the bladder,—if this has not already been completed,—splitting the anterior uterine

wall in the middle line, seizing the same on either side, and cutting it away piece by piece until it is destroyed and the fundus reached. The anterior retractor should continually follow the finger into the depths of the dissection, and the traction forceps should always secure a new hold on the tissues above before a piece is cut away. When the peritoneal cavity is reached, the Péan retractor, if not already in use, should be substituted for the anterior one, and should be pushed up into the cavity. Traction on the fundus will now cause it to roll forward and out into the vagina. Forceps are now applied to the upper half of the broad ligament from above downward and the uterus cut away. Should it be practicable, the adnexa are removed at the same time, otherwise they may be left. Pus-depots, whether in the tubes or elsewhere, are opened, washed out, and drained, care being taken to protect uninfected parts by gauze packing. Adhesions to the uterus can usually be separated under the eye after its inversion into the vagina. A pad of iodoform gauze is placed over the tips of the broad ligament forceps to protect the intestines from injurious pressure, and between the forceps and vaginal wall to protect the latter. The forceps are removed at the end of forty-eight hours and after gentle irrigation the dressing replaced. The gauze pads above the vaginal vault are not removed for six days. This latter is very important, as premature removal of gauze from the peritoneal cavity has often resulted in death by disturbing the adhesions by which Nature is trying to protect the peritoneum. Premature removal of this gauze also conduces to descent of the intestines.

Operations through the Posterior Vaginal Fornix.—It is sometimes expedient and occasionally necessary to explore the pelvis, drain an abscess, or perform other operations through the posterior vaginal fornix. Where there is reason to believe that virulent infectious matter exists in the pelvis the vaginal route is safer than the abdominal, and—conditions being favorable—should be chosen by preference. This will apply with special force to the acute streptococcic infections, in which removal through the abdominal route would greatly endanger infection of the peritoneum. In some instances large accumulations of pus in the pelvis may be drained through the vaginal fornix preliminary to the more radical operation by abdominal section. In such cases ample time should be given to drainage and irrigation, to reduce and improve the character of the infectious matter before resorting to section. The vaginal route may sometimes be chosen as a matter of convenience, as where the vagina is ample and short and the abdominal walls inordinately thick from obesity.

Operation.—The operation consists in making an opening into the peritoneal cavity just back of the cervix, as in the first step of vaginal hysterectomy. After thorough cleansing of the vagina, and, if necessary, curettage of the uterus, the perineal retractor is introduced and the cervix seized with a strong traction forceps. The incision is to be made near to and just back of the cervix where the vaginal mucosa is reflected from it. The line of demarkation between the attached cervical and free vaginal mucosa consists of an elevated crescentic fold of mucous membrane with its concavity toward the

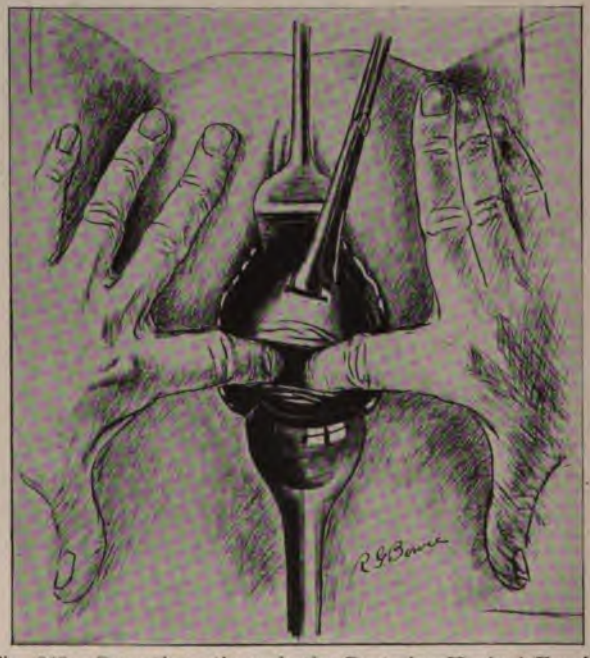


Fig. 243.—Operations through the Posterior Vaginal Fornix. Enlarging the Opening by Stretching.

cervix. This, if not apparent, may be made so by pushing up the cervix with the traction forceps. This fold should be seized near its middle with a tenaculum forceps, and, while the cervix is pulled downward and forward, traction is made on the mucosa downward and backward. An incision an inch in length is now made through the mucosa parallel to the fold, between the tenaculum forceps and cervix, and the dissection carried up to the peritoneum through the cellular tissue by means of the finger, aided, if necessary, by the scissors. The wound is made to gape by means of traction or re-

tractors, so that the peritoneum may be plainly visible. The peritoneum is picked up with a pair of delicate forceps and snipped, the opening being enlarged by spreading the scissors. In case of infected tubes or pus-depots with adhesions the peritoneum may not be recognized as a distinct membrane, and is liable to be fused with the structures above. Here caution will be necessary to avoid puncturing a bowel or other viscus, and sharp instruments should be used cautiously, if at all. After entering the peritoneal cavity there will usually be little difficulty in breaking up adhesions with the finger, nor will there be much danger of going astray, as the line of cleavage is easily followed. In this way the ovaries and tubes may be liberated and pus-depots broken into and emptied. Should the opening be too small, it may be enlarged to any desired extent by stretching. This is done preferably by introducing two fingers of different hands back to back and making pressure in opposite directions. (Fig. 243.) Through the enlarged opening the tubes may be delivered and removed. For explorative purposes the patient may be placed in the Trendelenburg position, the intestines maneuvered out of the pelvis by means of gauze sponges held in the bite of long-handled forceps, the uterus held forward on a trowel or retractor, and the pelvic cavity exposed by retracting the posterior lip of the wound. Under a good light a large area of the pelvic cavity becomes plainly visible.

After-treatment.—Where drainage is desired a good-sized rubber drainage tube is introduced into the cavity and brought down into the vagina. The drainage tube may be reinforced by a loose gauze packing, the upper end of which is engaged in the lips of the wound. A very efficient T drainage tube may be improvised from a piece of straight rubber tubing by splitting it down from the end an inch or more, making a hole on either side just below the angle of the split, and passing the ends of the split portion through the hole of the corresponding side (Reed). These ends project at the sides and prevent the tube from becoming dislodged. The drainage tube may be continued as long as desired. In case of exploratory section and where permanent drainage is not necessary the wound may be packed with gauze supported by a loose gauze vaginal tampon. It is better, as a rule, not to allow the gauze to project into the peritoneal cavity, but merely to fill the wound flush with the peritoneum. The upper gauze packing should not be disturbed until after it is roofed over, which will usually be in from six to eight days. The vaginal packing may be removed at any time after the third day if deemed necessary, otherwise it may be left until the upper packing is removed.

CHAPTER XXXII.

ECTOPIC GESTATION.

NORMAL pregnancy can only occur in the uterine cavity. Here, and here only, are to be found all the conditions for the reception, maturation, and expulsion of the products of conception. Ectopic pregnancy and ectopic gestation are the terms used to designate a pregnancy anywhere outside the uterine cavity. Extra-uterine pregnancy, as the term implies, signifies a pregnancy outside the uterus. This would apply to the overwhelming majority of cases of misplaced pregnancy, but there are a certain limited number in which the pregnancy occurs in that portion of the Fallopian tube which traverses the uterine wall to which the term extra-uterine would be clearly inapplicable. Ectopic pregnancy and ectopic gestation are, therefore, the better terms to use in a generic sense, as they embrace all forms of misplaced pregnancy.

The term "tubal pregnancy" is very much in favor, and has much to recommend it, in that it is definite and expressive of the exact situation of the ovum. Furthermore, there can be no question but that in almost every instance the primary implantation of the dislocated fertilized ovum is in the Fallopian tube. Still, there are grounds for believing that the primary implantation may, with extreme rarity, occur in the ovary: ovarian pregnancy. This view is supported by the fact, apparently well attested, that ovarian tissue has been demonstrated in the capsule of the gestation-sac, and the corresponding Fallopian tube found to be perfectly normal.

Dr. Catherine Van Tussebroek, of Amsterdam, Holland, came into possession of a perfect specimen of early ovarian pregnancy. Bland-Sutton, to satisfy himself as to its genuineness, visited Amsterdam, and was allowed to examine the specimen critically, and supplied with sections to take home with him. He reports the case as being complete in every particular. Still, there remains the possibility of the transference of the ovum from the tube or its fimbria to the ovary at a very early period, and a subsequent severance of the tubal connections.

With this one possible exception, ectopic gestation never occurs

primarily in any other place. The old idea that it might occur in the peritoneal cavity or in the pelvic cellular tissue has long since been exploded, and the presence of the ovum in these situations is accounted for by some one or other of the accidents to which it is subject in its abnormal situation, and by which it has become dislodged. These will be more fully explained later. Practically, because of its extreme infrequency and doubtful authenticity, ovarian gestation may be ignored and sole attention given to the various phases and manifestations of tubal pregnancy.

Gestation may occur in any part of the tube. It may occur ir the isthmus (isthmian pregnancy), in the ampulla (ampullar preg nancy), in the infundibulum or abdominal extremity of the tub

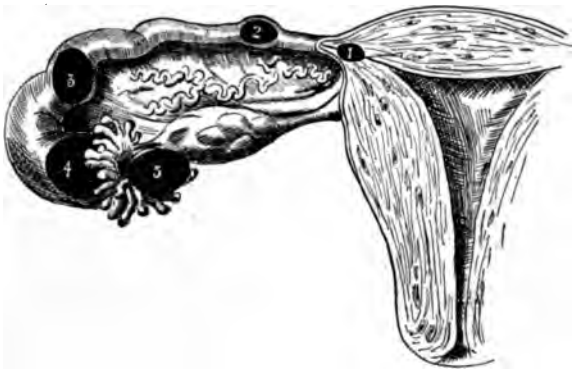


Fig. 244.—Ectopic Gestation, Showing Sites of Implantation of Ovum.
1. Interstitial pregnancy. 2. Isthmian pregnancy. 3. Ampullar pregnancy. 4. Infundibular pregnancy. 5. Tubo-ovarian pregnancy.

(infundibular pregnancy), or in that portion of the tube which traverses the uterine wall (interstitial pregnancy). (Fig. 244.) For years past it has been taught and believed that tubal gestation occurred most frequently in the middle portion of the ampulla. Bandler denies this, and claims that isthmian pregnancy is by all odds the most frequent. He adduces evidence to show that in a series of 148 cases only 18 were ampullar.

Some hitherto considered cases of interstitial pregnancy are due to the development of ova which have found their way into Gaertner's duct. When the ovum lodges in the infundibulum, the fimbria may become spread out over the ovary in such a way that in the subsequent development of the ovum both tube and ovary contribute to its support. This constitutes the so-called tubo-ovarian pregnancy.

These terms are convenient as indicating the site of implantation of the ovum, and are of practical importance as indicating the probable course of the gestation.

Causes.—The essential cause of tubal gestation is as yet one of the mysteries of medicine. In some instances no abnormality of the tube can be found to account for the anomaly. Hitherto the opinion has prevailed that tubal gestation was due to some lesion of the tube which interfered with its function as a carrier of the ovule from the ovary to the uterine cavity. Many of these lesions have been ascribed to the results of tubal infection. The tube may be distorted, bent upon itself, or bound down so as to interfere with its vermicular motion. Obstruction of the canal may result from polypoid growths, angulation of the tube, stricture, or by pressure from without. The motion of the cilia may be impaired as the result of disease, or the epithelium may be exfoliated in patches, leaving pitfalls into which the ovule tumbles and becomes hopelessly entrapped. In one case of my own in which it became necessary to remove the uterus to control the hemorrhage, examination of the specimen revealed an amplified uterine extremity of the tubal canal which would admit the little finger. Here the fetus had escaped into the broad ligament, and the placenta was attached to the posterior surface of the uterus under the peritoneum. The only explanation I could find for the arrest of the egg in this instance was that it had either fallen into a pit or—and this is more probable—that the enormously enlarged caliber of the tube toward the uterine side had deprived the ovum of the normal propulsive power by which it should have been assisted toward the uterine cavity.

Herzog repudiates gross tubal lesion as a causative factor in tubal gestation, and believes it to depend, in many instances at least, on a congenital abnormality. In several instances he has been able to demonstrate a blind passage or diverticulum from the true canal into which the ovule has wandered and developed. He believes, moreover, that the tubal mucosa participates in the menstrual act and undergoes the same changes in a minor degree as the uterine mucosa, whereby it becomes fitted for the reception of the ovum. This latter view is admittedly theoretical, and is unsubstantiated by tangible evidence. It is furthermore controverted by the experiments of Mandl and Schmit, which go to show that the healthy or normal tubal mucosa is not adapted to pregnancy, or, in other words, does not afford a suitable *nidus* for the ovum. These consisted in tying off the tubes of animals between the fecundated ovum and the uterus.

In no case did ectopic pregnancy result. When, however, the uterine horn was tied off, cornual pregnancy resulted, clearly accentuating the difference between the uterine mucosa and that of the tube. Herzog claims that a diseased tube is in no way responsible for tubal pregnancy, as it makes fecundation impossible. Undoubtedly, gross disease of the Fallopian tubes is incompatible with pregnancy of any kind, but the milder forms of tubal disease have been so universally regarded as standing in causative relation to tubal pregnancy that the commonly accepted views of the most careful and astute men of the profession should not be discarded lightly.

Course and Termination.—While it is possible for a tubal gestation to continue as such to full term, the conditions render such a termination exceedingly improbable. In uterine gestation the uterus grows *pari passu* with the development of the fetus, and there is at no time distension or thinning of the uterine walls. In tubal gestation the tube is distended from the first, or at least from a very early period after the implantation of the ovum, and the distension and thinning of the walls of the tube become more and more marked as gestation advances. The almost inevitable result is rupture of the tubal walls. This event is hastened by the encroachment of the chorionic villi, which, burying themselves in the tube-wall, still farther attenuate and weaken it. In this connection there exists also a material difference between tubal and uterine pregnancy. The tubal placenta is made up almost entirely of the fetal side, the maternal side being filmy in structure. In uterine gestation the maternal placenta is well developed and prevents the encroachment of the villi upon the uterine wall and consequent weakening of the same.

Changes in the Genital Apparatus.—A consideration of the changes in the tube and other organs of generation in connection with tubal pregnancy will go far toward explaining many of the phenomena attendant on this condition. As has been seen, when considering the causes of tubal gestation, there are reasons for believing that the tube undergoes preparatory changes for the reception of the ovum, coincident with and similar in character to those of the uterus. Microscopic research has demonstrated a decidua, and, after implantation of the ovum, the serotina. The distinctly circumscribed encapsulation of the ovum so as to confine the blood in the maternal sinuses within a distinct zone and in direct relation with the chorionic villi can only be accounted for on the hypothesis of a decidua reflexa, or by peripheral adhesions in close contact with the ovum. Analogy favors the former view. In the tube, as in the uterus, under like

conditions, there is also greatly increased vascularity, with edematous infiltrations of the tube-walls. This is most conspicuous at the site of implantation. This infiltration accumulates between the muscular bundles and in the meshes of the connective tissue, whereby the thickness of the tube-wall is increased at the expense of its strength and resistile capacity. In other words, the tube is thicker, but weaker, by reason of this infiltration. The muscle-fibers of the tube are increased in size, but not in number. This is conservative so far as it goes, but the muscular structure of the tube is so attenuated, and the increase in bulk so limited, as to count for little against the rapidly increasing pressure from within.

Soon after the implantation of the ovum the ostium abdominale begins to show signs of closure. The sealing of the tube is accomplished in the same way as in salpingitis: that is, by infolding of the fimbria and jutting forward of the peritoneal, circular margin and subsequent contraction of the same until the orifice is closed. This takes place gradually, but is usually completed before the expiration of the second month, sometimes within a period of three weeks. The size and shape of the tube will correspond to the period of gestation and the situation of the ovum.

True to its maternal instincts, the uterus undergoes changes in tubal pregnancy similar in character, though differing in degree, to those which occur in normal pregnancy. In anticipation of the expected guest which is never to arrive, it becomes clothed with a decidual membrane and begins to develop. The decidua thrives and grows up to a certain point, or until accident befalls the ovum, when it is cast off, either entire or in shreds. The development of the uterus does not throughout keep pace with the period of gestation, nor yet does it proceed in the same direction. Usually the increase in size is not very marked, but occasionally it attains a size equal to the third or fourth month of utero-gestation. The growth is principally in the direction of its long diameter.

Leaving out of consideration the continuance of tubal gestation to full term,—a contingency so remote as hardly to be worthy of consideration,—the terminations of tubal gestation are:—

1. By rupture of the tube. 2. By tubal abortion.
3. By death of the ovum.

Rupture of the tube is, by all odds, the most common termination. The rupture may occur into the peritoneal cavity or into the broad ligament. The relative frequency of intraperitoneal and broad

ligament rupture has never been established, but from the best data at our command it would seem that the former is twice as frequent as the latter. Very exceptionally, in the interstitial variety, the rupture occurs into the uterine cavity, whence the ovum is expelled *per vias naturales*. In by far the larger number of cases rupture occurs between the first and second month: usually about the seventh week. It is seldom delayed beyond the third month except in the interstitial variety, in which it sometimes goes on to the fifth month. In this variety rupture is apt to be delayed on account of the heavy muscular walls with which the ovum is surrounded. It is the most dangerous of all on account of the size of the vessels and the tremendous outpouring of blood which attends it. The suddenness and ferocity of the hemorrhage usually precludes successful surgical intervention.

The contributory causes of rupture of the tube in tubal gestation have already been alluded to. They are, first, the pressure of the growing ovum and distension of the tube-walls; second, the separation of the muscle- and connective tissue fibers by edematous infiltration; third, the weakening of the tube-wall at the site of placental implantation by the villi which have eaten into its substance; fourth, an effusion of blood, either in the tube-wall or ovum, which suddenly and at times greatly augments the rending force. This latter is usually the determining force which precipitates rupture, and also accounts for early rupture before the tube has become so distended as to give way before the growing ovum.

For reasons above stated, the rupture is most prone to occur over the site of the placenta, or where the villi are most concentrated. Rupture of the tube may be complete or partial. When a large rent is suddenly made in the tube the ovum is extruded and violent hemorrhage ensues. In partial rupture there is a more gradual and easy parting of the fibers, and hemorrhage is limited. Occasionally the ovum pushes into the rent and acts as a plug, preventing the effusion of blood. The effects of rupture, both immediate and remote, will depend largely upon the direction in which it takes place. As has already been seen, rupture may occur into the peritoneal cavity or into the cellular tissue between the folds of the broad ligament.

Rupture into the Peritoneum. — Rupture into the peritoneum (Fig. 245) is fraught with much immediate danger, as there is no provision for stanching hemorrhage except such as is inherent in the vessels themselves, or the accidental impaction of the rupture. While it is by no means phenomenal for a patient to survive the first rupture,

it is also a lamentable fact that many are swept into the grave by the profusion and persistence of the hemorrhage. A fatal hemorrhage usually terminates within twenty-four hours, and occasionally in much less time. When the ovum is extruded in its entirety, severing all vascular connection with its matrix, it quickly perishes, and if the woman survive the immediate perils of her situation the case may terminate happily. Much will depend on the stage of development and the presence or absence of infection. A non-infected dead ovum up to the age of several months may be digested and absorbed by the peritoneum. In many instances of ruptured ectopic gestation the ovum cannot be found at operation, either because it has taken refuge among the intestines or undergone digestion. If not absorbed

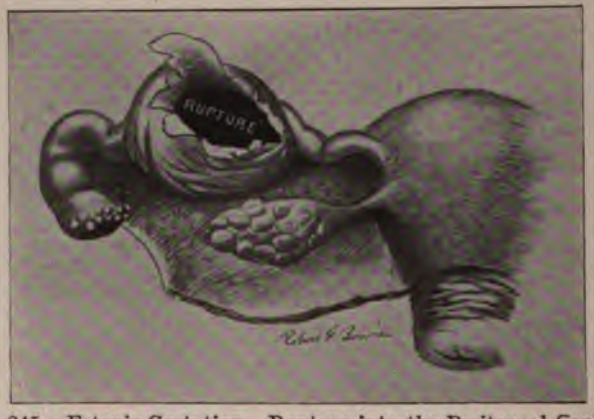


Fig. 245.—Ectopic Gestation. Rupture into the Peritoneal Cavity.

it may suppurate. The suppurating ovum with its attendant blood-clot is a malicious guest of the peritoneal cavity, and may easily lead to a fatal peritonitis. More frequently, however, in the earlier stages the ovum and clot become walled in, constituting a pelvic abscess, which may find an outlet spontaneously or require surgical intervention for its relief. Should the extruded ovum become encysted, it may mummify or be converted into adipocere or a lithopedian. If, however, it retains vascular connections with the tube, it may survive and develop. The growing placenta under these circumstances spreads over the adjoining territory and forms vascular attachments to other structures, such as the broad ligament, uterus, intestines, bladder, or abdominal parietes, from which it derives its blood-supply. The effused blood is either absorbed or breaks down into pus.

Rupture into the Broad Ligament.—When downward rupture into the cellular tissue between the folds of the broad ligament occurs, hemorrhage is seldom serious, because of the counter-pressure exerted by the resistant cellular tissue. (Fig. 246.) This results in the formation of a hematoma, which is limited or extensive according to the amount of hemorrhage. In this situation the blood clots more readily than in the peritoneal cavity. The embryo usually dies either from disruption of its vascular connections or from pressure. The blood-clot, with its contained embryo, is either absorbed or, if infected, suppurates and forms a pelvic abscess. Infection is much more frequent in this situation on account of the propinquity of the rectum. If the fetus survive the primary rupture, the placenta may form

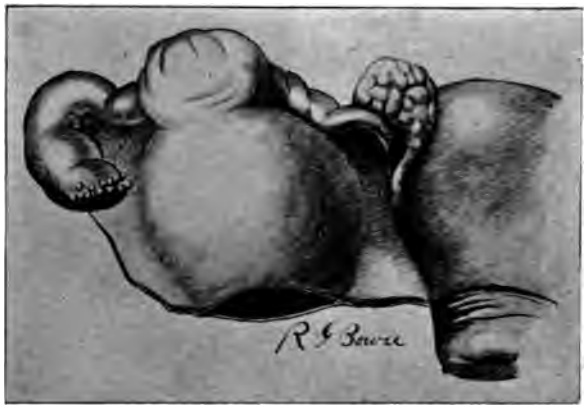


Fig. 246.—Ectopic Gestation. Rupture into the Broad Ligament.

attachments to the uterus, the floor of the pelvis, or spread out over the dome of the newly formed gestation-sac. In this situation and under these conditions the fetus has a much better chance of going to full term than in the peritoneal cavity. It makes room for itself by pushing aside the pelvic viscera and burrowing under the peritoneum. In this way it may strip off the peritoneum from large areas in the direction of its growth. The broad ligament gestations furnish a large proportion of the cases which reach full term. The tension of the broad ligament may, however, become so great as to result in a secondary rupture into the peritoneal cavity.

Tubal Abortion.—Tubal abortion is the extrusion of the ovum through one or the other of the natural outlets of the tube. (Fig. 247.) In the ordinary acceptation of the term it implies the extrusion

of the ovum through the ostium abdominale. This most frequently occurs when the ovum is located in the outer segment of the tube and in proximity to the ostium. It may result from muscular contractions of the tube, but more frequently from hemorrhage into the tube back of the ovum, which dislodges and pushes it in the direction of least resistance. The effects on the ovum are similar to those of rupture, and are influenced by the same conditions. In most instances it is destroyed, but, if by any chance the placental attachments are not too seriously interfered with, it may survive to battle with the same exigencies as beset the ovum which has been cast into the peritoneal cavity by rupture of the tube. Blood in the unruptured Fallopian tube

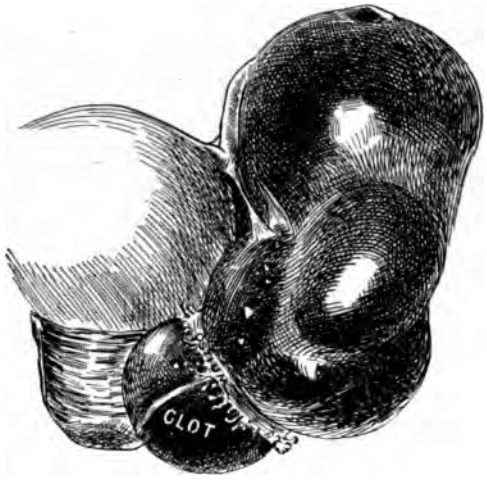


Fig. 247.—Ectopic Gestation. Tubal Abortion.
(Author's Case. Drawn from Specimen.)

is strongly suggestive of tubal abortion, which may be verified by finding the chorionic villi at the site of implantation.

Death of the Ovum.—It seldom happens that the product of tubal conception arrives at maturity. When it does, it is usually ill developed, malformed, and incapable of independent existence. Vast numbers perish at a very early period, not a few of which yield up life before being expelled from the tube. The unit value of the ectopic fetus is, therefore, almost *nil,* and should have no consideration when weighed against that of the mother.

Disposition of the Ovum or Fetus After Death.—The dead ovum in the earlier stages of development, whether it be in the tube, the

peritoneal cavity, or the cellular tissue of the broad ligament, usually undergoes absorption. The effused blood also disappears under the same process. Later, when fetal development has progressed to the formation of a bony frame-work, it will usually undergo one of several changes. If its sac is intact, absorption of the liquor amnii and the gradual desiccation of the tissues will result in mummification, or, by the deposition of calcareous salts in the tissues the fetus may be converted into a lithopedian. Such dried specimens are usually innocuous so long as they remain encysted and free from contaminating influence, from which they are almost immune. One or two cases have been cited in which they were carried by their hostess for a half-century or more, and numerous instances are on record in which they have remained quiescent during the natural life of the woman. An encysted calcified or mummified fetus is not incompatible with normal pregnancy.

When the fetus is deprived of its envelopes, the warmth and moisture, in the absence of air, may result in maceration or adipocere formation. Such cases are liable to become septic, and are always a serious menace to the life of the woman. The broken-down fetus may find exit through the rectum, vagina, bladder, or abdominal wall. In one case of my own the fetal *débris* was discharged through the rectum, and it became necessary to remove the angular and sharp-edged bones by the aid of the forceps. All that saves the life of the woman in these cases of disintegration of the fetus is the fact that they are usually walled off from the general cavity and protected by an enveloping cyst, which prevents the absorption and distribution of peccant matters through the general system. Nevertheless, the condition is full of peril, and not a few succumb to peritonitis or general toxemia.

CHAPTER XXXIII.

ECTOPIC GESTATION (Continued).

Symptoms.—The early symptoms, if any exist, are those of normal pregnancy. These may be well or ill defined, but are usually less marked than in normal pregnancy. The most characteristic of them —missed menstruation—will have a significance or not according to the menstrual habits of the woman. The habitually regular woman will take note of the fact, and will be inquisitive as to its cause. Women are seldom indifferent as regards pregnancy, being radically opposed to or ardently desirous of finding themselves in that condition. Hence they are usually on the alert for any manifestations of the same. Women who have previously borne children will often surmise pregnancy even when the symptoms are obscure, or when there is nothing definite upon which to base their opinion. Such surmises on the part of the mother should not be treated too lightly, for, although she may not be able to give voice to her impressions or punctuate the symptoms in detail, she is endowed with a sense which takes cognizance of the shadowy complexus, and places an interpretation on it which is oftentimes surprisingly correct. The close sympathy between the uterus and ovum makes of the former a telltale through which accidents befalling the ovum are announced. Anything that materially affects the integrity of the ovum is evidenced by a bloody discharge from the uterus. Hence, tubal hemorrhage, tubal abortion, rupture of the tube, and death of the ovum are habitually signalized by a bloody discharge from the uterus. Consequently it is seldom that the woman passes two consecutive periods without a show. In many instances this bloody discharge is looked upon as the reappearance of menstruation and regarded with complacency; or, if very profuse and long continued, as an abortion. Fragments of the decidua or casting of the same *en masse* seemingly confirms the diagnosis of abortion, and not only deceives the patient, but too frequently the physician as well, and lulls both into a false sense of security. The flow is seldom that of a regular monstruation, being intermittent, profuse, or dribbling.

Coincident with the above signs or sometimes later, the woman complains of colicky pains in the lower abdomen. They vary in severity according to the cause. They may be due to excessive distension of the tube, as a result of hemorrhage, or to parting of some of the fibers of the tube-walls. Sudden and complete rupture of the tube with violent hemorrhage is attended with agonizing pain, faintness, collapse, and all the indications of internal hemorrhage. The internal hemorrhage may be so profuse as to destroy life in a very short time. This is the usual termination in complete rupture of the more advanced cases, unless the woman be rescued by surgical intervention.

In some instances, the stagnation of circulation incident to the fainting will result in temporary or even permanent hemostasis. Not infrequently when the rupture is incomplete, the woman will have repeated attacks of this kind, though, as a rule, less violent until the fetus is expelled from the tube. In a case which fell to me in the fifth month of gestation, the patient gave a history of having experienced three previous attacks, in the last of which she had been confined to bed seven weeks. In the fourth attack, in which I was first summoned, I found her moribund from the loss of blood, and notwithstanding immediate operation and the use of restoratives, including hypodermoclysis of normal salt solution, she failed to rally, and died within an hour. In many instances there are no warning symptoms of which the patient takes cognizance, and the rupture comes with appalling suddenness.

Rupture into the broad ligament is often followed by paroxysmal and oft-repeated pains, due to the pressure or rending of tissues by the growing ovum. This, of course, applies only to cases in which the fetus survives the rupture. Tubal abortion may or may not be accompanied by symptoms of pain or internal hemorrhage. Effusion of blood into the peritoneal cavity, even though sterile, provokes a localized peritonitis, with its attendant pain and tenderness. The general appearance of the patient after a considerable internal hemorrhage from tubal pregnancy is anemic and distressed and oftentimes with all the facial indications of extreme illness.

Spurious Labor.—The culmination of a full-term ectopic gestation is tumultuous and tragic: stormy, fruitless labor for the mother, and death for the child. Spurious labor, in its outward manifestations, may closely resemble true labor, but is usually characterized by irregularity. The individual pains are of unequal frequency and intensity, with occasional lapses or even lengthy pauses between each

series. In other words, spurious labor is more like a series of short labors than the regularly progressive labor of normal gestation. It may last from several hours to as many days. When it is ended the child is dead and the mother undelivered, but the culmination is nevertheless auspicious, for, with the death of the fetus immediate danger ceases, and in a few weeks the placental circulation will have ceased or have become less active, when she may be delivered through the agency of surgery.

Physical Signs.—In the incipient stage of an ectopic gestation there are no physical signs. With the development of the ovum there

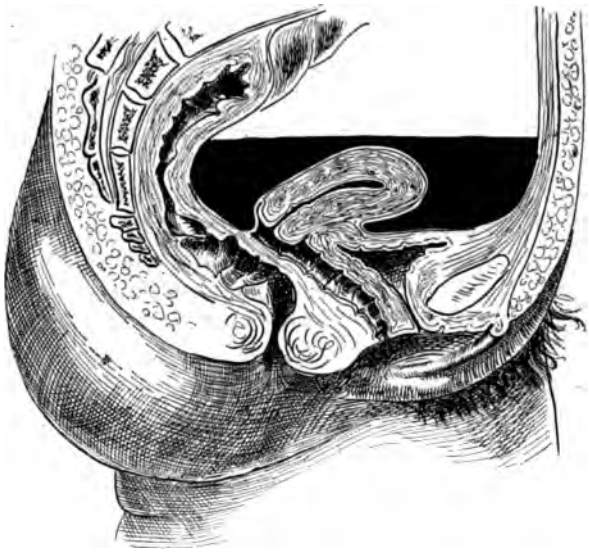


Fig. 248.—Hematocele.

will be a corresponding increase in the size of the tube. Later there will be an appreciable enlargement of the uterus, and there may be some softening of the cervix and patulousness of its canal. These signs become more marked with the advance of gestation, and may even become conspicuous, but, as a rule, those pertaining to the uterus seldom do. Before rupture the differentiation of tubal pregnancy from a pus-tube is most difficult. The experienced clinician might be able to distinguish a little more bogginess or an exaggerated pulsation of the tubal vessels, but ordinarily these finer distinctions are not apprehended by the average physician, nor can they be implicitly relied upon by an expert. Immediately after rupture the detection

of fluid in the peritoneal cavity is seldom practicable. The patient is in no condition for the systematic examination which would be of utility in determining that point, and the tenderness and rigidity of the abdominal walls render such an examination nugatory in the absence of an anesthetic.

After the blood has gravitated into the pelvis, coagulated, and become roofed over by adhesions, it becomes conspicuous as a tangible mass and easy of detection. An effusion of blood in this situation —that is, within the peritoneal cavity—is spoken of as hematocele in contradistinction to hematoma, in which the blood is effused into the cellular tissue between the folds of the broad ligament. The distinction is important, and the best way to keep the physical characters of each in mind is to remember the conditions under which the

Fig. 249.—Hematoma.

effusion takes place. In hematocele the effusion is unrestrained except by the boundaries of the peritoneal cavity, and when it settles in the pelvis it occupies the whole pelvic space symmetrically. (Fig. 248.) Through the vagina the distended Douglas pouch can be felt as an inverted cone or dome, with its apex in the median line. The uterus may be somewhat elevated and pressed against the symphysis, but it is not displaced laterally. The intestines crowded upward impart increased rotundity and resonance to the upper abdominal region. In hematoma, or rupture into the broad ligament, the effusion is limited by definite boundaries,—the folds of the broad ligament, on the one hand, and the resistant connective tissue, on the other,—so that a palpable fullness is immediately apparent. (Fig. 249.) It is either distinctly lateral or, if it encroaches on the other side, it does so by displacing the uterus toward that side. A finger in the vagina or

rectum and a hand on the abdomen will detect the mass extending from the uterus to the pelvic wall. If it occupy the left side of the pelvis it encircles the rectum and collapses its walls below the peritoneal attachment to the same, producing a stricture of the gut, and consequent difficult defecation, which is very characteristic of left lateral hematoma. This latter can be easily demonstrated by a finger in the rectum. Coagulation of the blood imparts solidity and distinctness to the hematoma which admits of definite outlining. Hematocele and hematoma are, in most instances, due to ectopic gestation.

Diagnosis.—*Before Rupture.*—It is seldom that the history and symptomatology of an ectopic gestation prior to the rupture of the tube are so well rounded as to warrant a positive diagnosis. Nevertheless the diagnosis is not infrequently made, and verified by exploratory incision. Such diagnoses, however, for the most part, are provisional and tentative, and based upon probabilities. Opportunities for such diagnoses are not as frequent as might be desired, for the reason that the symptoms of an early ectopic gestation before rupture are seldom sufficiently pronounced as to impel the patient to seek medical advice. In most instances, where the diagnosis has been made, the patient has been under medical surveillance for some other trouble, or, suspecting pregnancy, has consulted a physician to have her mind set at rest. Rarely she applies to the physician on account of symptoms directly attributable to the ectopic pregnancy. Ectopic pregnancy before rupture may be suspected if along with some of the symptoms of pregnancy—such as missed menstruation, morning sickness, or mammary changes—there exists a tubal enlargement on one side. The probabilities are increased: 1. If the tubal enlargement is of recent date and there is no evidence of recent infection. 2. If there is an absence of fever indicating the absence of acute tubal infection. 3. If the tube is boggy and pulsating. 4. If the patient gives a history of sterility extending over a number of years. This latter should not be accorded too much weight, as even fertile women may occasionally be the subjects of an ectopic gestation. Finally, in case of doubt, where the preponderance of evidence is in favor of ectopic pregnancy, curettage and microscopic examination of the scrapings will clear up the diagnosis.

After Rupture.—The diagnosis is much more easily made after rupture, as the indications are much more definite. Here will be found in a more advanced stage and in a correspondingly more marked degree the evidences of pregnancy as elicited by physical examination of the womb: the enlargement, shape, consistence, and cervical

changes which attend that condition. To these are added the physical changes in the tube itself, the colicky pains over the region of the tube, the faintness or collapse and other indications of internal hemorrhage: a bloody discharge from the uterus which contains shreds or casts of decidua. Usually there is very pronounced tenderness of the pelvic and lower abdominal regions, with rigidity of the abdominal walls from localized peritonitis. Later, when the blood has collected and coagulated, the physical characters of an hematocele or hematoma are conspicuously manifest. If the fetus survive, its regular and timely development, its movements, and the corroborative evidences elicited through ballottement, palpation, and the fetal heart-sounds, taken in connection with an empty uterus, leave no loop-hole for mistake. In all these investigations the fact should not be lost sight of that a normal and ectopic gestation may co-exist.

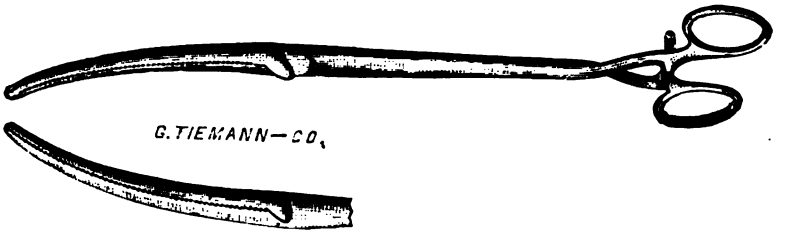


Fig. 250.—Clamp Forceps for Arresting Hemorrhage.

Prognosis.—Doubtless many cases of ectopic gestation would recover without treatment. This includes that very large contingent in which the ovum perishes early with or without rupture, and in tubal abortion where the hemorrhage is inconsiderable. But even here infection may call for interference at a later date. In many instances, however, the best interests of the patient are subserved by interference, and in most this to be effectual must be prompt. Profuse hemorrhage, as indicated by shock, should always be met promptly with knife and ligature.

Treatment.—*Operation.*—The dangers from operation up to the third month are so small as compared with the risk attending the average case of ectopic gestation as to justify the operation in every recognized case. The only treatment worthy of consideration is surgical. The operation for the relief of ectopic gestation may be among the easiest and safest or the most difficult and dangerous in surgery. The safety of the operation hinges largely on the stage of pregnancy and the site of placental implantation. Before rupture all that is

necessary is to remove the affected tube, than which nothing can be easier. After rupture with continued bleeding, the first requisite is to seek for and secure the bleeding vessels. The abdomen should be opened with all expedition compatible with aseptic precaution, and, after hasty removal of such clots as are immediately in the way, clamps should be applied to the ovarian artery. The first clamp is applied to the uterine extremity of the broad ligament, including the tube, and the second to the infundibulo-pelvic ligament near the pelvic wall. (Fig. 251.) Usually the first clamp will be sufficient to arrest the hemorrhage, as the vessels which supply the tube and ovum are recurrent branches of the ovarian artery, and receive a large propor-

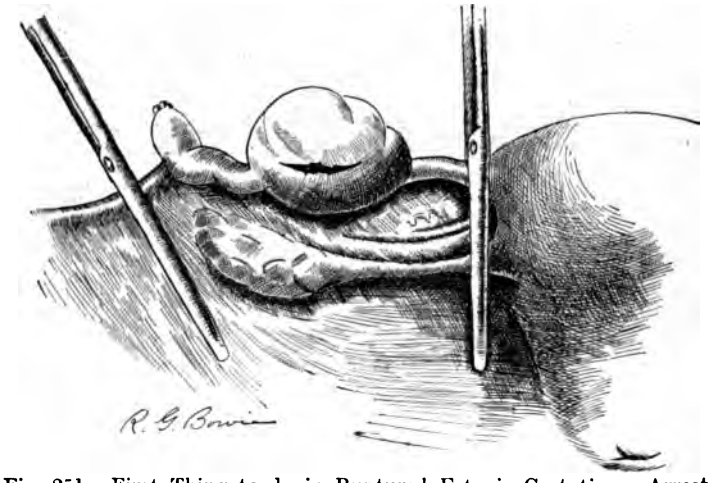


Fig. 251.—First Thing to do in Ruptured Ectopic Gestation: Arrest Hemorrhage by Applying Clamps.

tion of their blood from the uterine side through anastomosis with the uterine artery. After the hemorrhage is stanched the tube and its contents may be removed, ligatures substituted for the clamps, the cavity cleansed, and the incision closed. Where the patient is not greatly shocked from loss of blood, the toilet of the peritoneum should be conducted with great care and deliberation, either through sponging or flushing; but, in case of profound collapse or imminent danger to life, little attention should be paid to the blood in the peritoneal cavity, and the operation completed as quickly as possible.

After the fourth month the operation for ectopic gestation is fraught with so much danger as to almost exclude it from legitimate surgery. By most abdominal surgeons it is placed in the retired list

until after the death of the fetus, unless it should be imperatively demanded by the condition of the patient. This danger arises from the placenta and the risk of uncontrollable hemorrhage from disturbing its relations. A coiled rattlesnake in the peritoneal cavity would scarcely be more obnoxious to the surgeon or more dangerous to the patient than an unfavorably planted living placenta of advanced gestation. Before opening the abdomen, and in many cases even after the abdomen has been opened, it is quite impossible to determine the site of placental implantation until the gestation-sac has been entered. Not infrequently it is cut down on or partially detached before the operator is aware of the fact. Under these conditions the hemorrhage comes with startling suddenness, and immediately submerges the field, placing the operator at a woeful disadvantage. Under such circumstances quick action and well directed effort on the part of the surgeon are the only safeguards to the patient. If the placental attachment is such as to admit of ligation of the vascular feeders, all may be well, but if, on the contrary, the source of hemorrhage is inaccessible, the situation is pregnant with peril. Attachment to the free surface of the broad ligament or uterus usually admits of effective hemostasis by ligating the ovarian vessels of one or both sides. Occasionally it may be necessary to ligate the uterine vessels or even to perform a salpingo-hysterectomy. Occasionally, the uterine vessels cannot be reached from above without disturbing the placenta. In such case it may be expedient to clamp them through the vagina. When the placenta is attached to the intestines hemostasis by the clamp or forceps is impracticable.

In all cases where the removal of the placenta is considered extra-hazardous it should be left undisturbed. Here the sac should be opened cautiously; the fetus extracted; the cord clamped and cut, leaving the end protruding from the wound; the sac packed with gauze, and the mouth of the sac stitched to the abdominal wall. The gauze may be renewed at intervals of from five to eight days, or oftener if the exigencies of the case demand. As a rule, the less frequently the gauze is disturbed, the less danger of hemorrhage. Recently placed gauze adheres firmly to the tissues and may easily cause a detachment of the placenta in attempting its removal, whereas gauze which has been in contact with the tissues for a longer period becomes slimy and free, and can be removed with the greatest facility. Putrescence of the placenta may call for antiseptic irrigation or the application of liquid or dry antiseptics. I prefer the use of hydrogen dioxid, and absorption of the residue by means of sponges in the bite

of long, slender forceps. This maneuver should be executed with the utmost gentleness and caution to avoid hemorrhage.

In most instances if the fetus has survived the fifth month, it has passed through the cycle of rupture and hemorrhage or is not likely to do so; hence the immediate perils have greatly decreased, and it is better to wait until the dangers incident to the placenta have been eliminated before operating. This will occur after the cessation of placental circulation, which usually occurs within six or eight weeks after spurious labor, though it may be deferred much longer. The life of the child should not be put in the balance against that of the mother, for, as has been seen, such children are ill fitted for independent existence, and seldom survive. Partial detachment of the placenta with violent hemorrhage during the operation should be met with firm pressure over the placental mass by means of sponges or towels and digital compression of the aorta. After cleansing away the blood and examining the environments, if removal of the placenta is deemed feasible it may be proceeded with under aortic compression, the individual vessels ligated, and a firm compress applied over the site of placental implantation. A sterilized rubber bag filled with small shot makes one of the most effective compresses, and might, with advantage, be added to the armamentarium for such occasions.

CHAPTER XXXIV.

DISEASES OF THE OVARIES—DEFECTIVE DEVELOPMENT—DISPLACEMENTS—CONGESTION.

ANATOMY.

THE ovaries are two almond-shaped bodies, situated one on either side of the uterus and about one inch from it. They are about one and one-half inches in length, three-fourths of an inch in breadth, and one-half of an inch in thickness. The average weight of an ovary is about ninety grains. The pointed extremity of the ovary is directed toward the uterus, and its more convex broad surface posteriorly, so that it is easy to determine to which side an ovary belongs, even after removal from the body. Ovaries vary in size in different individuals, and in the same individual at different periods of life. In the healthy adult virgin the ovary is plump and smooth and is at the maximum of development. The ovaries are somewhat elongated in pregnancy, but without increase in other dimensions. After pregnancy they become reduced below the virginal standard and never regain it. In old age they become withered and wrinkled and bereft of functional activity. The infantile ovary is shaped like a caterpillar, and extends along the Fallopian tube. It sometimes preserves this form throughout life. I have recently seen one at the operating-table which was nearly or quite three inches in length. The ovaries of the same individual are seldom symmetrical in size or shape.

The attachments of the ovary are to the broad ligament, uterus, and Fallopian tube. That portion which lies in contact with and is adherent to the broad ligament is called the hilum. It is through the hilum that the ovary receives its blood-vessels, nerves, and lymphatics. The ovarian ligament attaches the ovary to the uterus. It extends from the inner pointed extremity of the ovary to the angle of the uterus between the Fallopian tube and round ligament. It consists of unstriped muscular tissue, and is covered with peritoneum. It is about one inch in length. The ovary is attached to the Fallopian tube by one of the fimbria. The infundibulo-pelvic ligament, being a continuation of the broad ligament from the extremity of the tube to the pelvic wall, acts indirectly as a support to the ovary through

the latter's attachment to the broad ligament and Fallopian tube. This ligament is about four-fifths of an inch in length, but becomes elongated in the child-bearing woman. The attachments of the ovary are such as to insure it a certain amount of mobility, and at the same time restrain it within certain prescribed limits. Through the ovarian ligament it always maintains a relatively close relation to the uterus and follows that organ even in its displacements.

The blood-vessels are the ovarian arteries and veins. The ovarian arteries are analogous to the spermatic arteries in the male. The ar-

Fig. 252.—Ripening Follicle, Human Ovary.
(Photomicrograph by Gramm.)

rangement of the veins is of considerable importance from a pathologic point of view. The right vein empties into the vena cava, which it enters at an acute angle. It is provided with a valve which effectually prevents a reflux of blood. The left vein enters the left renal vein at an obtuse angle and has no valve, which is supposed to account for the greater frequency of congestive and inflammatory troubles on this side.

The essential histologic element of the ovary is the Graafian follicle. Besides the Graafian follicles, the ovary is made up of connective tissue, unstriped muscle-fibers, blood-vessels, nerves, and lym-

phatics. The portion of the ovary which is not attached to the broad ligament is covered with germinal epithelium, which is continuous with, but differs in character from, the epithelium of the peritoneal investment of the broad ligament.

The ovary is divided into two portions: the oöphoron and the paroöphoron. These anatomic distinctions are of importance. The oöphoron is the essential functioning part of the ovary, and is made up principally of the Graafian follicles and their contained ovules. It is sometimes called the cortical portion, and constitutes the bulk of the free projecting portion of the gland. The ovules in an ovary

Fig. 253.—Cortex of Ovary, Young Girl.
(Photomicrograph by Gramm.)

are countless. They have been variously estimated at from thirty thousand to one-fourth of a million, an apparently prodigal provision for fertility and an indication of Nature's valuation of the reproductive function. These ovules are all formed before birth. The paroöphoron, or medullary portion of the ovary, forms the core of the gland and that portion which is in relation with the broad ligament, otherwise called the hilum. This consists of connective tissue, and, as has been seen, gives passage to the blood-vessels, nerves, and lymphatics. In this situation vestiges of fetal life in the form of gland-tubules sometimes form the starting-point for neoplastic growth.

ANOMALIES OF DEVELOPMENT AND POSITION OF THE OVARY.

Absence of the Ovary.—The ovary, as the essential organ of generation in the female, is so carefully provided for in the scheme of life that, so far as knowledge goes, it is never absent except in connection with the most gross and palpable defects of other portions of the genital apparatus. It will sometimes elude detection during life, either from malformation or malposition, but a carefully conducted autopsy will seldom, if ever, fail to bring it to light. If not found in the pelvis it may sometimes be found in a hernial protrusion, or possibly in the abdominal cavity, from whence it has never descended. The female generative organs, being of duplex origin, may sometimes be defective or wanting on one side. In such an event the ovary may be wanting on that side, as also its congener, the corresponding kidney.

Rudimentary Ovaries.—Persistence of the rudimentary state of the ovaries in the grown-up individual, while by no means common, is, nevertheless, sufficiently often met with to make it a matter of practical importance. It is usually associated with other evidences of immaturity, local and general, and stamps the patient with the impress of sexual crudity. This is manifested not only in the lack of finish of the genital organs, but also in the bodily conformation, carriage, and demeanor. The bodily conformation is usually that of a child, and is built on straight lines, with narrow hips, flattened bust, and hairless pudendum. The woman with rudimentary ovaries never menstruates and is always barren. As a rule, she is devoid of the sexual instincts. From the rudimentary type there are varying degrees of development of the ovaries, with corresponding approximation of the individual to the normal, both in structure and function. One fully developed ovary is sufficient to invest the woman with all the attributes of her sex. Occasionally the rudimentary ovary will be found associated with a normal physical development and the correlated graces, sexual impulses, and emotions of the perfect woman. It is probable that in such the arrested development of the ovaries is the result of disease in early childhood or before birth. Peritonitis and the exanthemata have received credit for stunting the growth of the ovaries. The subjects of the rudimentary ovary are, as a rule, shallow-minded, neurotic, and not infrequently the victims of hystero-epilepsy. These conditions are not incompatible with a childish vivacity and restless activity. A positive diagnosis as to the condition of the ovaries is seldom practicable except through abdominal section.

It can, however, often be forecast with a reasonable degree of certainty by a consideration of the salient features as portrayed above.

Treatment.—Treatment addressed to the ovaries with a view of encouraging development and function is entirely unavailing. Should the patient be harassed with violent cyclic disturbances or epileptic seizures corresponding in time to the normal menstrual period, the ovaries might be removed with a view of stopping their ineffectual impulses and with slight prospect of benefit to the patient, though it must be admitted that such a result is exceptional. I would expect more benefit from oöphorectomy in that class in which the ovaries were stunted by disease than where the glands were inherently destitute of developmental energy.

Supernumerary, or Accessory, Ovaries.—Bland-Sutton says: "As the evidence at present stands, an accessory ovary quite separate from the main gland, so as to form a distinct organ, has yet to be described by a competent observer." Notwithstanding this assertion from one of the highest known authorities, other observers of acknowledged ability have laid claim to the discovery of a supernumerary ovary. Winckel, Kochs, and Keppler each claim to have found a third ovary and tube. In the light of such multiplied evidence from such sources, the possibility of such an occurrence can hardly be questioned. Still, it must be admitted that the condition is one of extreme rarity and of slight practical importance. Lobulation of the ovary by constricting bands—the result of peritonitis—and more or less wide separation of the segments is of much more frequent occurrence, though by no means common. These separated fragments of a single ovary are often spoken of as accessory ovaries: an obvious misnomer. The accessory ovary and the scattered fragments of the divided ovary find their chief clinical importance in relation to the operation for bringing about an artificial menopause. Here it is essential that all ovarian tissue should be removed, and the object of the operation would be defeated should one of these bodies escape detection. The presence of an accessory ovary has been offered in explanation of the persistence of menstruation after the supposed complete removal of the appendages. The ultra-extreme rarity of the true accessory and the very great rarity of the divided ovary as compared with the frequency of the phenomenon alluded to invalidates the assumption except in very exceptional instances.

Displacements of the Ovary.—As before stated in describing the anatomy of the ovary, it enjoys considerable freedom of movement within normal limits, but is withal so definitely connected with the

uterus that it follows the movements of that organ both within and beyond its normal range. Minor displacements of the ovary are not easily recognized, for the reason that no definite radius marks the boundary between the normal and abnormal. Such distinctions, however, are of no practical consequence, as the slighter deviations have no pathology. Pronounced displacement may occur in any direction as the result of adhesion or morbid growths. A fibroid growth may lift or crowd the ovary far beyond its normal radius, as also may an adherent intestine. For the unadherent ovary *prolapsus* is, by all odds, the most common form of displacement. While the prolapsed ovary may preserve a position lateral to the uterus, the tendency is for it to gravitate into Douglas's pouch and toward the median line. Here it may contract adhesions, but in the absence of infection usually remains free. Ovaries thus displaced are apt to become enlarged and tender from circulatory interference, pressure, and trauma. The enlargement is due to congestion and hyperplasia, more frequently the former. The *symptoms* are those of pain and dragging, with various and indefinite reflexes. The pain is referred to the normal site of the ovary regardless of its abnormal position.

Treatment.—The habitual displaced ovary cannot be restored to position and held there by any mechanical contrivance yet devised. If of recent date, replacement and posturing in the knee-chest position, or a more or less sustained decubitus with the hips elevated, supplemented by the douche and tamponade to reduce pelvic congestion, may be of some avail. If associated with a displaced uterus, correction of the latter will usually be all-sufficient for the restoration of the ovary. Should the purely mechanical means fail to accomplish the result, the author's round ligament ventrosuspension of the uterus will be indicated. Should the ovarian ligament be very lax, it may be necessary to attach it to the proximal portion of the round ligament by a single catgut suture. This should be done before the round ligaments are drawn into the abdominal wall.

Hernia of the Ovary.—Hernia of the ovary is congenital or acquired. Both forms are rare and usually occur into the inguinal canal. Congenital hernia of the ovary is often bilateral, and when not so is more prevalent on the left side. It is due to the persistence of the canal of Nuck. It is often associated with hernia of the Fallopian tube and occasionally with that of the uterus. Acquired ovarian hernia usually follows a pre-existing inguinal hernia of the bowel or omentum, the ovary being drawn into the canal through adhesions to these structures. It usually follows parturition when the ligaments

are long and the tissues lax. It occurs most frequently on the right side. This form may take place through any of the canals leading from the pelvis: the crural, the greater sacro-ischiatic, or obturator foramina, or even the umbilicus.

Diagnosis.—A palpable enlargement in the groin, pressure upon which evokes a dull, sickening pain and nausea, is suggestive. If the patient be an adult, there may be an increase of bulk and tenderness at the menstrual period. If the condition is associated with intestinal or omental hernia, the characteristic symptoms of these may be superadded. Absence of the ovary from the pelvis, when this can be determined, will materially aid the diagnosis.

Treatment.—Except in recent cases it is seldom practicable to reduce the hernia by taxis. It should, however, be given a trial, and if successful a truss applied. Operation, as for hernia and reduction, or removal of the ovary, according to indications, will be found most feasible in the majority of cases.

HYPEREMIA, OR CONGESTION, OF THE OVARY.

A more or less persistent excess of blood in the ovary constitutes hyperemia in the pathologic sense. The condition is quite frequently spoken of as congestion of the ovary. A physiologic increase of blood in the ovary occurs in sexual excitement, at the menstrual period, and in pregnancy. Prolonged or inordinate sexual excitement is a prolific cause of hyperemia. Impediment to the venous circulation of the ovary, as in malpositions of the glands or twists of its mesentery, and the irritation resulting from the impact of morbid growths and foreign bodies, may give rise to it. An improperly used pessary is sometimes responsible for ovarian hyperemia, though in recent years this cause is not operative to anything like the extent that it was some years ago, when pessaries were so much in vogue. Ovarian hyperemia sometimes results from the vascular turgescence incident to inflammation of contiguous pelvic organs. Excessive hyperemia may result in the rupture of blood-vessels, the effusion of blood, and the formation of an ovarian hematoma. In the light of recent developments it is not improbable that some cases hitherto regarded as simple ovarian hematoma are, in reality, examples of ovarian gestation. Such instances are, however, undoubtedly rare. In a general way the hyperemic ovary resembles an inflamed ovary, from which it cannot always be distinguished at the bedside. It is only a short step from aggravated hyperemia to inflammation, but that step becomes an impassable gulf in the absence of the essential exciting cause: bacterial infection.

CHAPTER XXXV.

INFLAMMATION OF THE OVARIES (OÖPHORITIS).

As already intimated in the preceding section, ovarian inflammation is of bacterial origin. It is questionable if a true inflammation of the ovary arises from any other cause. Trauma, mechanical irritation, prolonged and aggravated congestion, sudden suppression of menstruation, acute rheumatism, and the eruptive fevers are occa-

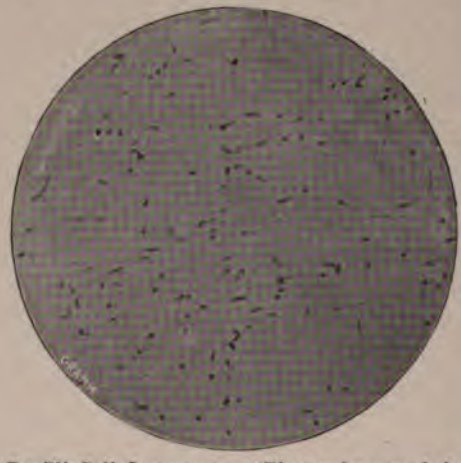


Fig. 254.—Bacilli Coli Communis. (Photomicrograph by Gramm.)

sionally accompanied or followed by oöphoritis, but where opportunity is offered it will almost invariably be found that some form of micro-organism is at the bottom of the inflammatory trouble. Some of these furnish the specific germ of infection directly, as the exanthemata; others through irritation or injuries by which germ invasion is facilitated. The bacteria concerned in the production of oöphoritis are practically the same as those of salpingitis, are derived from the same sources, and reach the ovary by the same avenues. The chief of these are the streptococcus and gonococcus, although the bacillus coli and the pneumococcus are of sufficient frequency to deserve mention. Almost any pathogenic germ may be the essential factor of an oöphoritis, and it is not improbable that the specific

germs of the eruptive fevers play a much more important rôle than is conceded to them; but this field has not been sufficiently worked to give prominence to such. The bacillus tuberculosis will receive separate consideration.

The infectious micro-organisms reach the ovary: 1. By the lymph- and blood- channels. 2. By continuity of surface over the mucosa of the vagina, uterus, and Fallopian tube. 3. Through the floor of an ulcer (intestinal) into the peritoneal cavity, thence to the ovary. 4. By contiguity of structure from intestine to ovary by way of adhesions binding them together.

By reason of its isolated position, primary infection of the ovary is of exceeding infrequency. Consequently oöphoritis is, as a rule, associated with infectious disease of other structures, which in many instances obscures or even masks the symptoms of the ovarian inflammation. In most cases the concomitant trouble is in or contiguous to the genital tract, and consists of an infectious endometritis, salpingitis, or localized peritonitis. The various portions of the genital tract are sometimes affected one after another with an appreciable interval between them, at others in such rapid succession as to appear almost simultaneous. Occasionally the virus will pass over or through the intervening structures—the uterus and tubes—to fasten upon the ovaries without leaving a mark in its course. Inflammation of the ovaries may be acute or chronic.

ACUTE OÖPHORITIS.

This is usually the result of streptococcic infection, and, as in most instances of such infection of other portions of the genital apparatus, is intimately associated with and in a measure dependent upon the puerperal state. The mode of invasion is almost exclusively by the lymph- and blood- channels. In consequence, the germs gain entrance to the intricate depths of the ovary and are disseminated throughout its substance. As where the germ is there will the inflammation be, the latter is apt to involve all the structures of the ovary from center to circumference. Its initial manifestations are, however, most conspicuous in the follicles, and in rare instances may be confined to the same. This constitutes the so-called follicular, or *parenchymatous,* oöphoritis. Less frequently in the acute form the inflammation is chiefly confined to the connective tissue, and is then denominated *interstitial* oöphoritis. These distinctions, while of interest to the pathologist, are of little practical value to the clinician, as it is usually quite impossible to differentiate them at the bedside.

As will be seen farther on, other germs may be the leading factors in the production of an acute oöphoritis, and the manner of invasion, course, and consequence of the disease modified accordingly. The gonococcus comes by way of the Fallopian canal and fastens upon the surface of the ovary, producing a superficial inflammation which has received the name of *perioöphoritis*. The gonorrheal germ seldom penetrates deeply into the substance of the ovary, and is never found in the pus of the deep-seated abscesses of the same. The gonococcus is a slow-going germ, and does not often give rise to an acute inflammation; nevertheless acute perioöphoritis of gonococcic origin does occasionally occur. The bacillus coli usually finds its way into the peritoneal cavity through the floor of an intestinal ulcer or passes directly from the intestine to the ovary through adhesions binding them together. In either event the ovary is attacked from the surface and the initial lesion is a perioöphoritis. This bacterium, however, is a deep-sea fish, and sooner or later penetrates to the depths of the organ, exciting inflammation as it goes. The pneumococcus is supposed to gain entrance through the general circulation. The ovarian lesion may occur independently of pneumonia or tuberculosis. It is very virulent, and extends its ravages to the peritoneum and adjacent structures. Happily, it is quite rare. The surface germs, such as the gonococcus and bacillus coli, sometimes find a ready passage to the deeper structures of the ovary through the corpus luteum.

Morbid Anatomy.—The ovary is swollen, soft, and succulent. The vessels are increased in size and the finer ramifications of the same apparent to the naked eye. The walls of the follicles are injected, the liquor folliculi turbid or blood-tinged, and the epithelium redundant, which sooner or later falls into disintegration. A round-cell infiltration crowds the stroma in the vicinity of the follicle and in the more aggravated forms pervades the entire gland. At a later period minute purulent points are disseminated through the ovary in greater or less abundance. These, by coalescing, form larger depots, and may go on to the complete destruction of the organ. Along with these internal changes the surface of the ovary becomes involved, accompanied by a superficial exudation and a responsive action in the contiguous structures, with the result that the ovary becomes bound down, covered over, and oftentimes completely hidden from view. The organs implicated with the ovary are usually the Fallopian tube, the broad ligament, or the intestine. These adhesions are sometimes dense and difficult to deal with, especially in the streptococcic infection, which, coupled with the fact that the pus is apt

to be virulent, has imbued surgeons with a wholesome dread of the purulent ovary. A less virulent infection may run its course without suppuration, and possibly without material damage to the ovary, though in most instances such structural changes are wrought as to virtually destroy its functional usefulness. Some ovaries are functionally useless that have all the macroscopic indications of perfect organs. This is more apt to be the case in the rheumatic ovary or in the lesions associated with the eruptive fevers.

Symptoms and Diagnosis.—Acute oöphoritis may be ushered in by a chill followed by fever, nausea, and vomiting. The local mani-

Fig. 255.—Oöphoritis. (Photomicrograph by Gramm.)

festations are pelvic pain and tenderness. The pain in its greatest intensity is referred to the normal site of the ovary, the tenderness to the actual position of the organ. These symptoms may be blended with and obscured by the disease of which the ovaritis is a part, or with which it may be associated, as endometritis or salpingitis. In diseases attended by great pain, as in acute rheumatism, or high temperature and general distress, as in the eruptive fevers, or obtunded sensibilities, as in puerperal sepsis, the ovarian trouble may be completely masked and go unchallenged. Physical examination will usually reveal the enlarged and tender ovaries, by which the diagnosis may be confirmed. They will often be found prolapsed behind the

uterus, and, as a rule, can be palpated to greater advantage through the rectum. The examination should neither be rough nor hasty. Gentle, persistent manipulation not only secures the co-operation of the patient, but overcomes the reflex antagonism of the guarding walls, thereby giving results surprisingly satisfactory where the first indications were anything but reassuring.

Treatment.—The treatment of acute oöphoritis is, in all respects, similar to that of acute salpingitis: rest in bed, saline laxatives, the ice-bag, or fomentations or other form of application to the abdomen, and, when well borne, the hot vaginal douche. Should the disease not yield to this treatment and suppuration occur, oöphorectomy should be performed. Here, however, as in salpingitis, operation should be delayed, if the indications are not too imperative, until such time as there is reason to believe that germ-life has become extinct. Unfortunately, this does not occur with the same promptitude nor certainty in the ovary as in the tube, and a period of quiescence does not have the same significance here as there. Therefore, at whatever period the ovaries are removed, every safeguard should be employed to prevent infection of the peritoneum, as the pus from an inflamed ovary is proverbial for its deadly rancour. Nevertheless, it is sometimes found of attenuated virulence or even sterile.

CHRONIC OÖPHORITIS.

Chronic oöphoritis occurs under two forms: cystic and cirrhotic. In the first the ovary is studded with small cysts varying in size from that of a small pea to a cherry. In some cases the entire ovary seems to have been converted into an agglomeration of cysts. In others they are sparsely distributed in the substance and over the surface of the organ. The cysts have their origin in the Graafian follicles, which have become distended with fluid and transformed into veritable cysts by fatty degeneration and absorption of the ovule and granular membrane. The walls are thickened and the vessels dilated. The contents of the cysts are usually watery, but may be blood-tinged, turbid, or mucilaginous. The stroma is infiltrated with embryonic cells which become converted into connective tissue. Whether these changes in the follicles are due to inflammation within themselves or to interference with circulation and nutrition, as a result of growth and pressure of the connective tissue, is still a moot question.

In the second, or cirrhotic, form there is a marked increase in

the connective tissue (interstitial) elements and a corresponding decrease of the follicles. This may culminate in the complete destruction of the follicles and substitution of connective tissue, or the process be arrested at any stage. In the cirrhotic ovary, as in other glandular organs, the morbidly developed connective tissue impinges upon and crowds out of existence the essential histologic elements, which are, in this case, the follicles. In the earlier stages of this form the ovary may be plump and elastic, but later it becomes dense, pale, and wrinkled. In some cases of chronic oöphoritis, the changes are confined to the surface, resulting in the formation of a dense, thickened tunic. This, by preventing rupture of the follicle and escape of the ovule, as effectually destroys functional activity as though the parenchyma had been destroyed.

Causes.—The causes of chronic oöphoritis are practically the same as those of the acute form of the disease, but of modified intensity. Many cases arise from the acute form by mergment into the chronic state. Gonococcic infection is essentially sluggish and furnishes many examples of chronic oöphoritis. The causes of ovarian hyperemia which have been enumerated under that head are contributory to chronic oöphoritis, but are not in themselves sufficient to produce the disease.

Symptoms and Diagnosis.—The local symptoms are pain and tenderness. These are not usually so marked as in the acute form, and are subject to great variation in different patients and in the same patient at different times. Even in the comparative absence of pain, tenderness may be evoked by pressure on the ovary. The pain is increased by the intra-abdominal pressure and gravitation of blood to the parts, as in bodily exercise, or the erect position, as also by coition and defecation. It is also increased by the congestion incident to the menstrual period. Many cases of chronic oöphoritis are attended by menorrhagia. This is especially true of the cystic ovary, which gives rise to a most intractable form of uterine hemorrhage. The most prominent of the reflex symptoms occur in connection with the digestive and nervous systems. These are sometimes the chief source of complaint on the part of the patient. Sterility is not uncommon, both because of the destruction of the follicles and by reason of the thickened capsule, which prevents the rupture of the follicle. Palpation of the ovary will reveal its unnatural tenderness. In the earlier stages, and in the cystic form, the ovary will be found enlarged. Later in the cirrhotic form the ovary may be reduced in size and of fibrous consistence.

Prognosis. — Chronic oöphoritis, once well established, seldom ceases during the active sexual life of the woman. In some cases it subsides into a low grade with little symptomatology; in others it nags the woman continually and renders her life bereft of pleasure or usefulness. Cure by medicinal treatment is not to be expected, though the patient's condition may be much improved thereby. Most cases recover after the menopause.

Treatment.—The treatment is palliative and radical. Continual circumspection is required on the part of the patient to avoid such excitations and exposures as are known to be injurious. Ample time should be allotted to recumbency and rest both night and day; the bowels should be kept soluble and coition indulged in moderately, if at all. The patient should keep her bed at the menstrual period, and should take to bed upon the first indication of renewed trouble, and remain there until it has passed off. Hot vaginal douches should be taken morning and night, and the vaginal vault painted with Churchill's tincture of iodine, or a combination of this with ichthyol once a week. This should be followed by a tampon saturated with boroglycerid. If the patient is unable to avail herself of these measures, or if in spite of them the disease continues unabated, the offending organ should be removed.

TUBERCULOSIS OF THE OVARY.

Tuberculosis of the ovary, at one time questioned, is now a demonstrated fact and of not infrequent occurrence. Next to the tubes and uterus, the ovaries are the most frequently affected of the genital organs. It has been found that the ovary is frequently tuberculous even when there are no outward manifestations of the disease. This applies especially to the miliary form. The manner and method of infection are as yet undetermined. It will probably be found that infection may take place through any of the avenues by which germ infection usually takes place. The fact that the miliary tubercle is so generally found in the superficial zone of the ovary would give color to the belief that such infection comes either by way of the tube or peritoneum. While cases of tuberculosis of the follicle have been reported, the process is, for the most part, and to a greater degree, confined to the stroma. The miliary form is much less frequent than the caseous. In the latter the ovary is enlarged (sometimes greatly so), covered with plastic matter, and adherent to the uterus or broad ligament. The caseous deposits, varying in size from a mere speck to

that of a marble, are disseminated through the stroma, and, as the disease advances, form larger cavities by development and coalescence. In this way the ovary sometimes becomes converted into a mere sac of matter, and may attain the size of the fetal head. While the miliary tubercle has been repeatedly demonstrated, the tubercle bacillus is seldom found.

There are a number of incidentals connected with the microscopic examination of the ovary for tuberculosis that make it a matter of considerable difficulty, even for the experienced microscopist. It will be recalled that the miliary tubercle consists of the giant cell imbedded in a mass of smaller cells, and that caseous degeneration represents another phase of tuberculosis. In the ovary the giant cell cannot be depended on as indicating tuberculosis, as it is asserted on good authority that the giant cell in an isolated form is to be found in the non-tuberculous ovary. On equally good authority it is claimed that caseous deposits may be found in the ovary independently of tuberculosis. It is furthermore asserted that section of the atrophied follicle and of the normal follicle to one side of the ovule presents a picture so like the miliary tubercle as to be scarcely distinguishable from it.

The differentiation can only be made by noting the difference in arrangement of the nuclei of the giant cell and those of the follicle. In the giant cell the nuclei are less regularly arranged, but are so disposed that their long axes are in direct line from center to periphery, something like the spokes of a wheel, whereas in the follicle the long axes of the nuclei intersect this line obliquely. In most instances, however, in the tuberculous ovary, the typical tubercles may be found in some portion of the structure, which, if clearly brought out, would dispel all doubt.

Symptoms and Diagnosis.—Miliary tuberculosis of the ovary has no symptomatology. The abscess formation within the ovary, coupled with the peritoneal involvement, will give rise to the usual symptoms of pelvic abscess, which may be severe or mild according to individual conditions. There is no reliable method of differentiating the tuberculous ovary from the inflamed and enlarged ovary from other causes; still, there are certain indications which, taken in connection with the history of the case, will not infrequently lead to a correct diagnosis. The tuberculous ovary is, as a rule, only slightly sensitive. It usually becomes agglutinated to the side of the uterus or to the broad ligament, and is often associated with a healthy tube, or, if the tube be diseased, it is at the uterine extremity which characterizes the

tuberculous salpingitis. If in connection with these symptoms the patient gives evidence of tubercular infection elsewhere, or is of a tuberculous family, and there are no tangible evidences of other form of infection, a diagnosis of ovarian tuberculosis may be made with considerable confidence.

Treatment.—The only treatment worthy of thought is the removal of the offending organs. This is eminently satisfactory, and, when not complicated by too extensive local infection or by general or pulmonary tuberculosis, is usually sufficient to stamp out the disease.

CHAPTER XXXVI.

OVARIAN CYSTS—FOLLICULAR AND GLANDULAR.

THE ovary, more than any other organ of the body, is a fertile field for neoplastic growth. Especially does this apply to the cystic growths, for here, more than anywhere else, are the anatomic conditions favorable to the development of cysts. The parenchyma of the ovary is little else than a conglomeration of cysts—the Graafian follicles; the entire physiologic life of the ovary is devoted to the

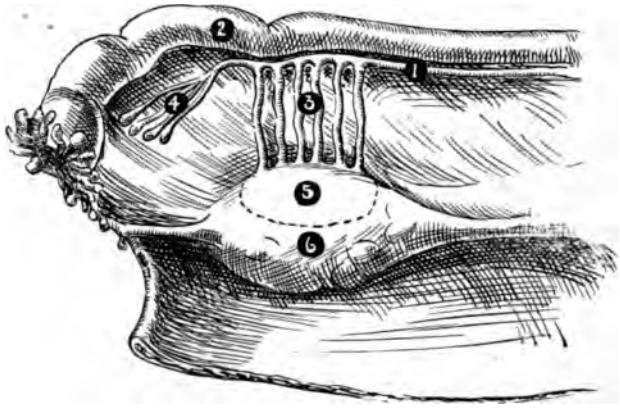


Fig. 256.—Scheme Showing the Different Positions from which Cysts may Originate.

1. Gärtner's duct. 2. Fallopian tube. 3. Vertical tubules of parovarium. 4. Tubules of Kobelt. 5. Paroöphoron. 6. Oöphoron.

nurturing and development of the same, which by easy transition may be transformed into pathologic cyst formations. The tubules of Pflüger—remnants of embryonic life—also contribute to the formation of pathologic cysts by becoming occluded and filled with the secretion of their lining epithelium. Other methods of cyst formation will be alluded to later.

The neoplasms of the ovary are divided into *cystic* and *solid.* The cystic growths of the ovary are much more common than the solid, and present a diversity of character and structure. To simplify and facilitate the study of these, a number of different classifications have

been formulated, most of which have more or less merit, but, with advancing knowledge, one after another has fallen into disuse. These classifications have been based upon certain characteristics by which the cysts of the ovary may be divided off into groups, each group being distinguished from the other by some dominating attribute, such as place and mode of origin, structural formation, or clinical history. One of the best of these classifications, because the simplest and most easy of comprehension, is that in which the cysts were grouped according to the region from which they sprang. Thus, cysts of the oöphoron constituted one group, of the paroöphoron another, and of the parovarium still another. It was maintained that the cysts originating in one of these groups were different in structure and clinical features from those of the others. Modern research has rendered this beautiful scheme untenable because inaccurate. The varieties of cyst formation of the ovary and its environment are not circumscribed by definite anatomic boundaries. In that classification the so-called glandular cysts were supposed to originate in one of these marked-off zones, and the papillary cysts in another, which, as will be seen later, is wholly incorrect. Without violence to any of the known attributes of ovarian cysts they may be grouped under the following heads:—

1. Simple cysts. 2. Proliferating cysts.
3. Dermoid cysts.

SIMPLE CYSTS.

These are little, if anything, more than retention cysts which enlarge more from an accumulation of their contents than from actual growth. They are lowly organized, sparsely supplied with blood-vessels, and are not endowed with the property of propagating daughter-cysts or other form of neoplastic growth. In most instances the cyst-wall becomes thinned by distension through the accumulation of cystic contents, though exceptionally the growth of the wall keeps pace with the increase of contents. Simple cysts never attain a large size, and are often denominated *small cysts*, in contradistinction to the proliferating cysts, which are practically of unlimited growth. Simple cysts are subdivided into: *(a)* follicular cysts; *(b)* cysts of the corpus luteum; *(c)* tubo-ovarian cysts.

Follicular Cysts.—These take their origin in the ovarian follicles, and are primarily the result of any condition which prevents the rupture of the matured follicle. Chronic oöphoritis, which imbeds the follicle in a connective tissue matrix, increases the density and

thickness of the tunica albuginea, or covers the surface of the ovary with a plastic exudate, is supposed to be the dominant factor in the production of follicular cysts. The inflammation may also contribute to the cyst formation by increasing the activity of the epithelial cells lining the cyst-wall, and by promoting transudation into the cyst-cavity. Under this stimulus also the rudimentary follicles in the deeper portions of the ovary may be prematurely developed. In this way a number of follicles may be affected simultaneously, but, as a rule, one dominates the others and crowds them out of existence, or fuses with them to make one large cavity.

With the enlargement of the cyst the ovary itself becomes atrophied and spread out over its surface, forming a thickened portion of the cyst-wall. The follicular cyst, as usually found, seldom exceeds the size of an orange, though cases are on record in which it has attained the size of the fetal head or even the adult head. In the earlier stages the membrana granulosa remains intact, but sooner or later becomes modified, so that a stratified epithelium supplants the columnar. In the larger cysts the epithelium is entirely wanting, having undergone fatty degeneration or pressure atrophy. The ovules are also destroyed at a comparatively early period, though occasionally an ovule may be found in a cyst of considerable magnitude. The contents of the cyst are usually clear and limpid, with a specific gravity of from 1.005 to 1.020, though they may be darkly discolored from the presence of blood or purulent from septic infection. Hemorrhage into the cyst may convert it into a hematoma. Clinically, the small follicular cyst is indistinguishable from the cystic ovary of chronic oöphoritis. Where the cyst exceeds in size that of the normal ovary, it is safe to class it as a follicular cyst. As a rule, both ovaries are involved, though this is not a rule without numerous exceptions.

Cyst of the Corpus Luteum. — These have their origin in the corpus luteum, and are the result of degeneration and cystic distension of its cavity. It does not appear how the rupture in the follicle becomes closed so as to allow the cystic distension, but it is probably the result of adhesive inflammation. The cyst of the corpus luteum, like other follicular cysts, seldom attains a large size, and as usually found does not exceed that of a hen's egg. It is round or oval in shape, of a grayish or yellowish-gray color, and is provided with thick walls. The walls consist of two layers, the outer of which is fibrous, while the inner preserves the characteristic hue and appearance of the corpus luteum. This inner yellow layer is loosely attached to the outer layer, and is thrown into folds. Under the microscope

this layer reveals the budding processes peculiar to the corpus luteum. The contents are usually clear and watery. Hemorrhage into the corpus luteum may give rise to a distinct blood-cyst, which under exceptional circumstances may attain a large size. The corpus luteum cyst is unilocular, usually single, and located at one of the poles of the ovary. Exceptions as to size, number, situation, and contents of the corpus luteum cyst are occasionally noted, as in that of the follicular cyst.

Tubo-ovarian Cyst.—This, as its name implies, is a cyst conjointly involving the tube and ovary. It is the result of a communication being established between the cystic cavity in the ovary and the tube, the latter of which may or may not be cystic. The pathology of the tubo-ovarian cyst is unsettled, but it is probable that the term embraces a number of different pathologic processes characterized by cyst formation conjointly involving the ovary and tube. It may arise from any form of cystic distension of the tube, such as pyosalpinx or hydrosalpinx, which forms a communication with any form of cyst of the ovary, such as the follicular or corpus luteum cyst or ovarian abscess. Conversely any of these cysts of the ovary may burst into the undistended, but adherent, tube, with the result of forming a tubo-ovarian cyst. The only excuse for considering the tubo-ovarian cyst in this relation exists in the fact that the majority of such cases are supposed to arise from the follicular cyst. In all cases of tubo-ovarian cyst the tube is agglutinated to the ovary, either by its fimbriated extremity or at some other portion of its length, and the opening between the two may be at the os abdominale or at any point of contact. The tubo-ovarian cyst has but one cavity, though there is usually a spur or remnant of the septum where the walls have been destroyed between them. The cyst is distinctly retort-shaped, the globular end of which is formed by the ovary and the stem by the tube. The contents are usually clear, but subject to variation. In some cases the cyst discharges its contents through the tube into the uterus at more or less regular intervals, by which it is temporarily relieved. The tubo-ovarian cyst is usually not larger than an orange, though it may attain to several times that size. It is usually extensively, if not densely, adherent to contiguous structures.

Symptoms.—The symptoms are essentially the same as those of chronic oöphoritis, and consist of pain over the region of the ovary, with the various reflex phenomena which attend the chronically inflamed organ. To these are added pressure symptoms when the cyst is impacted, and the embarrassment incident to adhesions when such

exist. Menorrhagia and metrorrhagia are sometimes prominent symptoms, as in cystic oöphoritis.

Diagnosis.—Bimanual examination will reveal the enlargement and oftentimes its cystic character. The suffering and disability engendered by the simple cyst of the ovary are proportionately much greater than in the proliferating cyst of equal size, which, as a rule, is devoid of either. The absence of development after it has attained its limit of growth will also aid in the diagnosis if the patient be kept under observation. The simple cyst is more frequently bilateral than the proliferating cyst.

Treatment.—The only treatment for cystic disease of the ovary is surgical, as no other remedial measure is of the least avail. If one could be sure of the diagnosis, simple cysts of the ovary unattended by suffering might be safely ignored, as they are not intrinsically dangerous, but the possibility of mistaking a papillomatous or dermoid cyst, which are dangerous at any period, for a simple cyst makes it safer to operate in all cases. Unless there be cogent reasons to the contrary, it is better to remove the diseased organ, and if, as is frequently the case, the tube is seriously affected, it should be removed likewise. If, however, both sides are affected, the question of sterility becomes of paramount importance. Here if it is found possible to do so with reasonable assurance of success, a conservative operation may be performed by eradicating the cyst and bringing the raw surfaces together with fine suture. Where this cannot be done, a shaving of sound ovarian tissue left attached to the pedicle will at least perpetuate the menstrual function, and may avert absolute sterility. Usually, however, the pathologic conditions of the ovary will be such as to offer little encouragement for conservatism.

PROLIFERATING OVARIAN CYSTS.

The proliferating ovarian cyst, as its name implies, is characterized by a more or less active proliferation of its histologic elements, more especially of the epithelium and connective tissue. It is highly organized, abundantly supplied with blood-vessels, and, as already intimated, has a growth of its own. In most instances the proliferating cyst is a breeding cyst: that is, it gives birth to other cysts, which, in turn, may develop and breed still other cysts. Cysts which give rise to secondary cysts have been designated *proligerous* cysts, but, as will be seen later, they are not essentially different from the ordinary proliferating cyst, as the secondary cyst formation is a mere

incident resulting from the overproduction and tubular depression of the epithelium into the cyst-wall, the mouths of which have become occluded. Instead of cystic formations in the walls of the mother-cyst, there may spring from its walls little warty excrescences, which develop into papillomatous growths. This gives rise to two distinct forms of cystic growth known, respectively, as:—

1. Proliferating glandular cyst.
2. Proliferating papillomatous cyst.

Fig. 257.—Glandular Cyst of the Ovary. (Photomicrograph by Gramm.)

The *glandular* cyst is so called because of its epithelial clad chambers into which the actively secreting cells pour their elaborated secretion. The dominant histologic feature of this form is the epithelial growth. The *papillomatous* cyst is so called because of the papillomatous growth which develops from the cyst-wall and usually grows toward the interior of the cyst. The dominant histologic feature of this form is the connective tissue growth.

Pfannenstiel proposes to classify the proliferating cysts according to their chemical constituents, or rather with reference to the presence or absence of a definite chemical constituent in the contents of the cyst. This substance, long recognized as a frequent constituent

of the contents of the proliferating cyst, was formerly known as paralbumin or metalbumin, but closer inquiry into its nature divulged the fact that it more nearly resembled mucin. It differs from mucin, however, in not being precipitated by acetic acid, and contains an element of sugar which is liberated when boiled in the presence of dilute mineral acid. In consequence of its resemblance to, but non-identity with, mucin it has been given the name of pseudomucin.

Fig. 258.—Papillomatous Ovarian Cyst, Woman Forty-seven Years Old. (Photomicrograph by Gramm.)

The cysts which contain this substance are designated as *pseudo-mucinous* cysts, while those that do not contain it are called *serous* cysts. The amount of this substance found in the contents of pseudo-mucinous cysts varies within wide limits. Some with gelatinous contents, as the smaller colloid cyst, are exceedingly rich in pseudo-mucin, while others with more liquid contents contain much less of it. The pseudomucinous cyst also differs from the serous cyst in the character of its epithelium, the epithelium of the former being cylindrical, while that of the latter is columnar and very frequently is ciliated.

While at first sight this classification may seem to differ radically

from that into glandular and papillary, there is, in reality, little practical difference between them. The glandular cyst is characterized by an albuminoid or mucoid secretion, while the contents of the papillary cyst are serous or watery. As a matter of fact, the glandular cyst is the pseudomucinous cyst, and most papillary cysts are serous cysts. The exceptions to this rule are so infrequent as to be of little consequence. The behavior, clinical course, and consequences of the glandular and papillary cyst are so widely different and the gross appearances of the two so strikingly unlike that it is a matter of much more importance to distinguish between them than to determine whether a cyst does or does not contain a definite chemical substance. This does not, however, minimize the value of the discovery nor

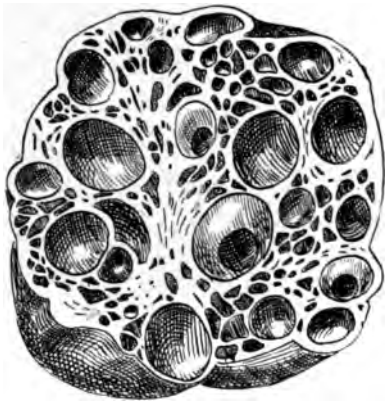


Fig. 259.—Areolar Cyst.

detract from its usefulness as a means of diagnosis, or of determining the nature of questionable growths.

Aside from the classification just considered there are a number of variations in structure and substance which for convenience of description are designated by terms expressive of each. Thus: a *unilocular* cyst is a cyst having but one chamber; a *multilocular* cyst is one that is divided into a number of compartments or chambers; an *areolar* cyst is one that is composed of a great number of small cysts bound together by an areolar or loose connective tissue, and which upon section presents a honeycombed appearance; a *colloid* cyst is one in which the contents are gelatinous in consistence, and a *myxomatous* cyst one in which the connective tissue stroma is softened and mucoid in appearance and character.

GLANDULAR CYSTS.

These are sometimes designated as *multilocular ovarian cysts, ovarian adenomata,* and *pseudomucinous cysts.* They are by far the most common of the cystic growths of the ovary. They are usually unilateral, both ovaries being affected in only about 4 per cent. of the cases. The glandular cyst is of unlimited growth, and if not interfered with will continue to develop until the woman is crowded out of existence. In times past, when abdominal surgery was little practiced and less believed in, there were many instances of enormous

Fig. 260.—Colloid Cyst, Ovarian. (Photomicrograph by Gramm.)

cystic growth of the ovary. Such tumors are now seldom found, owing to the facility and safety with which they can be removed. The majority of ovarian cysts encountered by the surgeon of to-day will average from ten to twenty pounds in weight, or even less, though occasionally they are much larger. In very exceptional instances, as the result of ignorance or timidity on the part of the patient, ovarian cysts of enormous magnitude are met with. Carteledge has reported one weighing two hundred and forty-five pounds, upon which he operated with a fatal result. This is the largest on record. In the

spring of 1899 I operated on one weighing one hundred and seventy-six pounds. The patient is still living and in excellent health. With the one exception, so far as I know, this is the largest ovarian cyst ever successfully removed.

The glandular cyst is found most frequently during the active period of sexual life, or between the ages of thirty and forty-five, though it occurs much earlier or later in life. Neither infancy nor extreme old age is exempt. Nulliparous women are more subject to these growths than child-bearing women. This has been ascribed to the uninterrupted recurrence of pelvic congestion incident to menstruation in the sterile woman. The *shape* of the tumor depends much on its composition and structure. In a general way it is approximately spherical or ovoid, but is sometimes distinctly lobulated, and may be very irregular in outline. The irregularity of contour is principally due to the combination of cysts entering into its composition. The older cysts are usually smooth, and conform to the shape of the abdomen. The *outer surface* of the glandular cyst is smooth, glistening, and pearly, though this is sometimes modified by the character of the contents, as seen through the wall, or to inflammatory or necrotic changes affecting the latter. The *wall* of the cyst consists of fibrous tissue with a sparse scattering of elastic tissue and unstriped muscle-fibers. Normal ovarian tissue is sometimes demonstrable in the vicinity of the pedicle, which is always flattened and spread out and never recognizable as a distinct organ. The occasional discovery of a corpus luteum in this tissue signalizes the fact that glandular cystoma is not necessarily incompatible with pregnancy.

The cyst-wall is thickest in the vicinity of the pedicle and thinnest at the opposite pole. It is divisible into three layers: an external and internal fibrous, and a middle layer of loose connective tissue. In the thinner portions of the cyst-wall these layers are fused, and do not admit of separation. The outer surface of the cyst is covered with a layer of germinal epithelium: a heritage from the free surface of the ovary. The inner layer is covered with cylindrical epithelium similar in character to the epithelium of mucous membrane, to which it sometimes bears a striking resemblance. In the larger growths these cells may flatten out under pressure, assuming the character of pavement epithelium, or they may even disappear, leaving the walls of the cyst unclad and bare. The middle layer of connective tissue gives passage to the larger blood-vessels and lymphatics, and is usually very vascular. These vessels also ramify on the surface of the cyst and in the connective tissue between the loculi. In some cases, especially in the

areolar form, these vessels are very large and abundant, and may give rise to serious or even fatal hemorrhage if they are injured and unattended to.

The glandular cyst is always multilocular. In the earlier stages it is obviously so; but as the growth advances the septa melt away under pressure until in some of the older growths there remains apparently but one cavity. Close inspection will, however, always reveal the ridge-like elevations on the interior cyst-wall which are the atrophied remnants of the septa, or small flattened cysts jutting from the interior or imbedded in the substance of the wall. The unilocular glandular cyst is therefore one in appearance only.

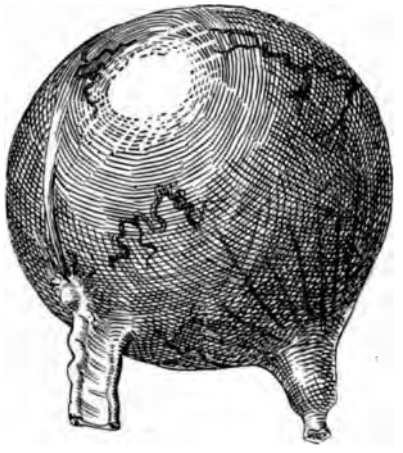


Fig. 261.—Ovarian Cyst with Double Pedicle. (Author's Case. Drawn from Specimen.)

The *contents* of the glandular cyst represent the secretion of its epithelial lining. This secretion in its pristine form is more or less thick and turbid, with a specific gravity of from 1.010 to 1.050. In its physical properties it is subject to great variation in different cysts and in different loculi of the same cyst. Ordinarily it is of about the consistence of molasses, though it may be of any consistence, from that of a thick-set jelly to that of an attenuated mucus. It is oftentimes tenacious, ropy, and slimy. In very old cysts it is occasionally almost watery, though even under these circumstances it is apt to retain its turbidity. This thinning of the cyst contents is probably due to the degenerative and pressure changes of the epithelium. The contents may be amber-hued, ochery, green, brown, or black from the

admixture of blood. Exceptionally it is colorless. The *pedicle* of the ovarian cyst is made up of the ovarian ligament, the crest of the broad ligament, and the Fallopian tube. It is generally thickened and elongated. The pedicle may be long, slender, short, thick, or broad. In bilateral ovarian cystoma the cysts sometimes become fused, in which case the apparently single tumor would have two distinct pedicles. (Fig. 261.) Unless the true condition was recognized, the situation would be very embarrassing to the operator.

CHAPTER XXXVII.

OVARIAN CYSTS—PAPILLOMATOUS, DERMOID, AND TERATOMATA.

PAPILLARY OVARIAN CYSTS.

THE distinguishing characteristic of this cyst is a papillary growth springing from the interior of the cyst-wall. The papillary cyst is frequently intraligamentous, and according to the older classification was supposed to spring from the paroöphoron, or from the remains of the Wolffian bodies situated therein. While this view is not supported *in toto* by recent investigation, there is reason for believing that occasionally, at least, these growths do take their origin in that part of the ovary in relation to the broad ligament, and that, in growing in the direction of least resistance, they make their way between the folds of the broad ligament. In many instances, however, they develop in the direction of the peritoneal cavity and are distinctly pedunculated. The relative proportion of papillary cysts which develop between the folds of the broad ligament and into the peritoneal cavity is indeterminate, and varies in the experience of different operators. Probably there is not much difference between these two modes of growth.

The extraperitoneal, or intraligamentous, cyst has no pedicle, and in its removal must be enucleated. The papillary cyst is usually bilateral; in fact, so commonly so that, in every case where a papillary cyst is found affecting one ovary, the other should be scrutinized carefully for evidence of like affection. The papillary cyst, unlike the glandular cyst, is of limited growth, the cyst seldom attaining a size larger than the adult head, though in exceptional cases it has equaled that of the uterus at term. These cysts are apparently unilocular, and, in the sense of having but one large cavity, they are so; but careful examination will always reveal small cystic spaces in the wall. Scientifically, therefore, they are multilocular, while practically they are unilocular.

The *cyst-wall* proper consists of two layers, both of which are fibrous, the outer being compact and dense and the inner less compact and loose. Unstriped muscle-fibers are sometimes found in the

outer layer. Blood-vessels abound in both layers. When the cyst is intraligamentous,—that is, when it grows between the folds of the broad ligament,—it acquires an additional envelope, the peritoneum. The internal surface of the cyst is covered with a single layer of columnar epithelium, which is often ciliated. From the interior of the cyst-wall spring papillary growths which may be in the form of small, warty excrescences or large, arborescent masses. The latter have a distinct stalk, from which the branches are given off like the branches of a tree. (Fig. 262.) These are sometimes grouped, sometimes disseminated over the entire surface. They are covered with the same epithelium that lines the cyst-wall.

The papillomata are usually of a grayish aspect, though they may be of a dusky-red or darker hue from the pigment of extravasated blood. They are subject to fatty and calcareous degeneration. Fatty degeneration imparts a yellowish tint to the growth. The *contents,* unlike those of the glandular cyst, are clear and watery, with a specific

Fig. 262.—Stalk of a Papillary Cyst.

gravity of from 1.005 to 1.035. Most examples of this growth belong to the serous variety of Pfannenstiel, and are devoid of mucin. The fluid is amber-tinted, but may be variously discolored from the admixture of blood. It is partly a secretion from the lining cells and partly a transudation from the blood-vessels. Exceptionally, the growth partakes more of the nature of the glandular or pseudomucinous cyst, when the contents may be turbid, slimy, or thick, from the presence of mucin. One of the most frequent accidents of the papillary cyst is the rupture or perforation of the cyst-wall by the papillary growth. (Fig. 263.) As a result, the fluid contents escape, and the papillary growth develops untrammeled in the peritoneal cavity. Occasionally the papillary growth from the internal surface of the cyst-wall is so luxuriant that it completely inverts the ruptured sac like an inverted puff-ball, the sac being transposed to the interior of the growth. Such cases are sometimes mistaken for a papillomatous growth emanating from the surface of the ovary.

Metastasis of the papillary growth almost invariably occurs after rupture or perforation of the cyst-wall. The metastasis is usually confined to the peritoneum, though it may affect any tissue exposed to contact with the growth or its secretions. It is due to the ingrafting of small particles of the papilloma on the surface of the exposed tissue. In this way all the peritoneal surfaces—visceral and parietal—may become infected and give rise to secondary growths. When once formed they are difficult to eradicate, reinfection occurring in spite of the most painstaking effort on the part of the surgeon. The fluid contents of the growth may be the medium of infection even though the growth itself does not come in contact with the peritoneum. The abdominal walls in the line of incision are sometimes infected, and in the intraligamentous variety the papillary growth sometimes eats its way into the bladder, rectum, or uterus. Ascites is a common

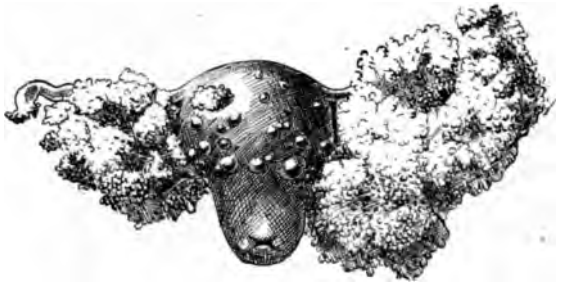


Fig. 263.—Ruptured Papillary Cyst of the Ovary.

accompaniment of papillary infection of the peritoneum. It is sometimes present in the absence of peritoneal involvement. Because of the metastasis and tendency to recurrence, the papillary cyst is the most dangerous of abdominal cysts, and, although a benign growth, is not much less to be dreaded than the malignant growths, after it has once broken through the cyst-wall.

Histogenesis of Proliferating Cysts.—For many years the histogenesis of ovarian cysts has been a subject of earnest inquiry and much laborious research. The question is not yet settled, though much has been learned of a definite character which places the matter on a firmer basis than at any previous period. Formerly all cystic growths of the ovary, of whatever character, were supposed to originate in the Graafian follicles. Later, this view was supplanted by that in which the origin of the glandular cyst was referred to the tubules of Pflüger, and of the papillary cyst to the remains of the

Wolffian body. The tubules of Pflüger, it will be remembered, are formed by the growing downward into the ovary of the surface or germinal epithelium in the form of tubular processes. It is from them that the Graafian follicles are developed; but occasionally the last step of the process is not completed, and some of the tubules remain and persist throughout life. Under some form of stimulus these tubules were supposed to be quickened into activity, resulting in the formation of the glandular cyst.

Later research has shown that the Graafian follicle is, to some extent at least, concerned in the production of the proliferating cyst, and possibly to a much greater extent than has been definitely determined. In this respect pathology has experienced a partial reversal which carries it back to that period in which all ovarian cysts were supposed to have their origin in the Graafian follicle. While the former view was too radical, it will be seen that the cystic tumors almost without exception have their origin in the inward-growing germinal epithelium which is represented in the tubules of Pflüger, the Graafian follicle, and other epithelial collections in the substance of the ovary. It is claimed on good authority that at any period of life the germinal epithelium may grow downward into the ovarian stroma and form the starting-point of a proliferating cyst. It is not improbable, therefore, that an ovarian cyst may take its origin in either the Graafian follicle, the tubules of Pflüger, the inverted surface epithelium, or the remains of the Wolffian body. Another very important fact recently developed is that the glandular cyst and the papillary cyst may originate from the same source, that the determination of one or the other is apparently fortuitous, or that they may be blended in the same growth. It is claimed that all cysts—the papillary as well as the glandular—start in a proliferation of the epithelium of the structure from which they spring, and that this epithelium becomes redundant, so that there is not room for it to lie flat on the internal wall of the cyst.

The nature of the cystic development will depend upon the direction in which this redundant epithelium develops. If it grows into the cyst-wall in the form of a glove-finger or tubule, the orifice will become constricted by the underlying connective tissue, and a closed cavity result, which will develop into a secondary cyst. This is the origin of the glandular cyst. If, on the contrary, there is an upheaval of the epithelium toward the cavity of the cyst, a fissure or crevice will be formed at some point of the epithelial covering of the basic membrane, which latter will grow up through the gap and

develop into a papillary growth. This is the origin of the papillary cyst. This view of the determining factors of differentiation between the glandular and papillary cyst is based entirely upon the physical aspects as revealed by the microscope. In my opinion, the essential cause of differentiation lies deeper than these surface indications, and the upward or downward growing of the epithelium by which the character of the cyst is determined is not a matter of accident, but an inherent and predetermined property of the growth as definitely fixed as any other evolutionary process of the body.

DERMOID CYSTS.

The dermoid cyst, as its name implies, is a cystic growth in which are found dermoid, or skin-like, structures. Dermoid cysts are found in various parts of the body, but the ovarian dermoid differs from the others in certain essential particulars which stamp it as a distinct form of growth. The distinguishing features of an ovarian dermoid, as compared with others, will receive attention farther on. The dermoid is the least frequent of the cystic growths of the ovary, constituting only about 3 to 5 per cent. of them. Simple dermoid cysts of the ovary are usually small, ranging in size from that of an orange to that of the adult head. They may become larger as the result of inflammation or by fusion with glandular cysts with which they are often associated. They are usually unilateral, although in about 15 per cent. of the cases they are found on both sides. Occasionally two or more dermoids will spring from the same ovary. The typical dermoid is unilocular. Fusion with other dermoids of the same ovary or communication with the chambers of the glandular cyst may give the impression of multilocular formation, but careful inspection will reveal the dual character of the growth.

The ovarian dermoid has been found at every period of life, from infancy to extreme old age. They are most frequent between the ages of fifteen and forty-five, or during the menstrual epoch. The dermoid is usually an intraperitoneal growth and pedunculated like the glandular cyst, but occasionally it grows downward between the folds of the broad ligament and has no pedicle. The external surface of the dermoid presents a dull aspect, and is frequently of a yellowish or brownish hue. The walls of the dermoid are composed of one external fibrous layer, to the inner surface of which is attached the skin-like substance from which the cyst derives its name. This may clothe the entire inner surface of the cyst-wall, or be limited to cir-

cumscribed areas. Beneath this membrane and between it and the external layer is an adipose structure. In the skin-like structures are found all the elements and attributes of the skin, such as hair, nails, horny projections, and sebaceous and sweat glands. In the adipose tissue beneath may frequently be found tissue and structure formations in great variety, such as bones, teeth, cartilage, unstriped muscle-fiber, and brain and nerve tissue. Less frequently, glandular formations resembling the mammary and thyroid glands, and most rarely structures resembling the imperfectly formed eye and ear and other anatomic parts in a more or less perfect state are present. In fact, almost every tissue and structure of the human body has been found in the ovarian dermoid. It is this great variety of tissue elements which distinguishes the ovarian dermoid from the dermoids of other localities, in which, as a rule, only skin and its appendages are found.

The situation of these structures in the walls of the cyst is marked by a prominence which is designated as the parenchyma body. In many instances the structural formations are rudimentary and imperfect, but in shape and arrangement they often approximate that of the human body. The hair of the ovarian dermoid is usually of a blonde or reddish-brown color, though it may be variously shaded. In color it bears no relation to that of the surface of the body. It may become gray or white with age. It may clothe the entire dermoid surface or be distributed here and there in the form of tufts. It is usually short, but has been known to attain a length of five feet. (Fig. 264.) It is constantly being shed and mingles with the cyst contents. It is sometimes found rolled up in balls of fat. The teeth are usually imbedded in bone or cartilage, which may resemble the jaw, and are set vertically. They are sometimes found free in the cavity. They are usually few in number and imperfectly formed, though as many as three hundred have been found in a single dermoid, and some very perfect specimens are occasionally met with. The incisors and molars largely predominate. The bones are usually in the shape of plates and spiculæ, and simulate the bones which lie under hair-covered surfaces, such as the jaw, cranium, and pubis. Less frequently other forms of osseous structure are represented, especially the long bones and joints.

The contents of the dermoid cyst are made up of the secretions and off-scourings of the dermoid membrane, and consist of sebaceous matter, hair, and exfoliated epithelium. They are oily, pultaceous, or semisolid, and of a yellowish or brownish color. After death or

removal from the body the contents solidify. The ovarian dermoid is quite subject to inflammation and suppuration, when it becomes very dangerous. Even in the apparently unaffected dermoid the contents are apt to be acrid and sometimes virulent, from which a fatal peritonitis may ensue should any escape into the peritoneal cavity. Tapping of the ovarian dermoid has resulted fatally in a number of cases.

The Histogenesis of the ovarian dermoid is not as yet fully determined. Two theories are advanced to account for the conditions as we find them. The first, which is known as the "inclusion" theory and which held sway for many years, supposes the growth to take its

Fig. 264.—Ovarian Dermoid Containing a Switch of Hair Fourteen Inches Long. (Author's Case. Drawn from Specimen.)

origin in a bit of displaced embryonal substance which has become imbedded or included in the ovary, and which under some form of stimulation assumes the protean forms of development as found in the dermoid. The second, known as the "ovular," theory supposes the growth to take its origin in the ovule, in which alone are blended all the elements which go to make up the tissues and structures of the human organism. Under normal conditions the evolution of the ovule takes place under the energizing influence of the spermatozoa, but here the stimulus is unknown and the tendency is in the direction of parthenogenesis. The number and variety of anatomic structures found in the ovarian dermoid, embracing almost every

phase of tissue formation, and representing all three of the embryonal layers, are most easily accounted for on the hypothesis of an ovular origin, and this is the prevailing sentiment of to-day. Wilms sustains the ovular theory by cogent argument, backed by careful and extensive research. It is only proper to say that Bonnett, still adhering to the inclusion theory, supports it by ingenious reasoning, claiming that parthenogenesis is not an attribute of the higher forms of animal life, such as the vertebrates and man.

TERATOMATA.

The teratoma is closely allied to the ovarian dermoid in that it contains anatomic and structural formations bearing resemblance to those of the human organism. Like the dermoid, it is supposed to originate in the ovule. Unlike the dermoid, it is not cystic, but made up of solid structures, though it may be interspersed with numerous small cysts, the result of degenerative changes. It is absolutely atypical in its histologic elements, structure, and arrangement, and consists of a heterogeneous conglomeration of elements and parts confusedly jumbled together. The epithelial cells are atypical, as in cancer; and the connective tissue structures are embryonic, as in sarcoma. It is a pedunculated growth, lobulated, and presents a smooth external surface. The growth is unlimited, and may attain enormous proportions. It is exceedingly malignant, and is disseminated both by metastasis and implantation. By some it is supposed to represent a malignant degeneration of the dermoid cyst at an early stage, which would account for the disarrangement and confusion which are so characteristic of the growth.

THE COMPLICATIONS OF OVARIAN CYSTS.

Ovarian cysts may be complicated with local and systemic conditions of almost every conceivable character. The most important of these, because the most frequent, are: inflammation, adhesion, suppuration, torsion of the pedicle, ascites, and rupture.

Inflammation.—Inflammation is common, and is usually the result of infection from the Fallopian tube, vermiform appendix, intestine, or bladder, in the order named. The smaller pelvic cysts are more subject to inflammation than the larger cysts which occupy the abdominal cavity. Dermoids are especially liable to inflammation. Among the most common results of inflammation of ovarian cysts are

the *adhesions* which they contract with contiguous structures. Sometimes these adhesions are quite limited, and when so usually occur between the infecting organ and the cyst. Thus, the adhesions may be limited to the tube, appendix, a loop of intestine, or the bladder. Quite frequently, however, they are more extensive, and may involve the entire cyst-wall with all environing structures. Recent adhesions are soft and easily broken up, but the older adhesions are apt to become organized and dense. The latter are vascular, and sometimes contain vessels of large size, especially if connected with vascular organs, such as the uterus, bowel, or bladder. Adhesions are not always an unmitigated evil, as might appear at first sight, for it sometimes devolves on them to preserve the vitality of the cyst when the blood-supply is cut off through the pedicle. The appendix is frequently attached to the cyst-wall, and should be looked after in operation lest it be forcibly torn asunder with disastrous consequence.

Occasionally an inflammation of the cyst terminates in *suppuration*. The dermoid cyst, because of the character of its contents, is especially prone to suppuration. Suppurative infection of the cyst through tapping used to be of frequent occurrence, but is now happily seldom seen because of the discontinuance of the practice. The suppurating ovarian cyst gives rise to severe constitutional symptoms, as manifested in the pulse, temperature, gastro-intestinal disturbance, and loss of flesh and strength. These are due to the absorption of toxic elements, and will culminate in death unless relieved. The suppurating cyst contracts adhesions to adjacent viscera through which the pus finds exit. In this way it may discharge into the bladder, bowel, vagina, rectum, or through the abdominal wall. When it discharges into the bladder it generally provokes a violent cystitis. The dermoid is peculiarly irritating. Hair, bones, and teeth thus occasionally find their way from the cyst-cavity into the bladder. These may form the nuclei for vesical calculi, and the hair sometimes becomes wadded and engaged in the urethra, interfering with the evacuation of the bladder and adding greatly to the distress of the patient. When the cyst connects with the bowel, and sometimes as the result of decomposition, the cyst-chamber becomes partially filled with gas. This imparts to the cyst a tympanitic note on percussion which may be confusing to the examiner.

Torsion of the Pedicle.—Axial rotation of the ovarian cyst, with consequent twisting or torsion of the pedicle, is an event of not infrequent occurrence. On an average, it occurs in about one case in ten. The torsion may consist of one partial turn, or there may

be many complete turns, so that the pedicle is twisted into the semblance of a rope. The *causes* of the rotation of the tumor on its axis are not known. It has been ascribed to the alternate filling and emptying of the bladder, to the passage of the fecal mass along the colon, and to bodily movements, such as turning in bed. It occurs more frequently with the smaller cysts, and for some reason is more frequent in pregnancy. The direction of rotation is usually from without inward. The results will depend upon the degree of torsion and the rapidity with which it is accomplished. In fact, the whole matter depends upon the amount of compression to which the vessels which supply the tumor and which reach it through the pedicle are subjected by the torsion. The veins, being more compressible than the arteries, are the first to suffer. In consequence, the venous blood is dammed up in the tumor and the vascular channels greatly engorged. Sooner or later rupture of the overdistended vessels occurs, and blood is poured into the cyst-wall and cavity. Very exceptionally a rupture will occur on the external surface of the cyst-wall and the blood escape into the peritoneal cavity. As a rule, the external surface of the cyst becomes covered with a plastic exudation, which causes it to adhere to the viscera.

The *symptoms* are rapid enlargement of the cyst, accompanied by rending or tearing pains and shock, followed sooner or later by evidences of toxemia. Patients have died from the loss of blood alone. In aggravated cases which survive the initial stage the cyst-walls may become necrotic from pressure, the extravasated blood exerting such pressure as to shut off the blood-supply in the circulating vessels. Where the torsion comes on gradually the vessels in the pedicle may accommodate themselves to the altered condition, and there may be no appreciable effect on the tumor. In chronic torsion the pedicle sometimes becomes twisted in two, mainly as the result of pressure atrophy and arrested circulation, thus severing the tumor from its normal connections. In such cases the cyst may derive its blood-supply from the structures to which it has become adherent.

Diagnosis.—The diagnosis is based on the rapid enlargement of the cyst, the attendant pain, and the evidences of shock, and constitutional symptoms indicative of toxemia. A previous knowledge of the cyst and its *status* makes the diagnosis easy.

Treatment.—In acute torsion of the pedicle with rapid enlargement of the growth and the coincident phenomena of pain and shock, immediate removal of the cyst is called for. Temporizing usually results in increased disability and accumulated difficulties and dan-

gers. The patient should be sustained by the use of cardiac stimulants, such as strychnine and brandy hypodermically, clysters of asafetida, and hypodermoclysis of normal salt solution. She should be well protected against cold, the operating-room brought to a high temperature, and the operation performed as expeditiously as compatible with safety. Owing to the altered condition of the cyst-wall, the use of the trocar may not always be feasible. In such cases a free abdominal incision through which the cyst may be delivered entire, or an incision into the the cyst which will admit of rapid evacuation of the cyst contents, should be practiced. A Turck sterilized rubber bag filled with hot water and thrust into the peritoneal cavity to counteract shock may sometimes be used to advantage, especially if the operation be prolonged for any reason.

Rupture of the Ovarian Cyst.—This is an accident which, though not often brought to the attention of the surgeon, is much more frequent than such a fact would indicate. Spencer Wells in a series of three hundred cases found that rupture of the cyst had taken place in 8 per cent. of them. Many ruptures probably occur in the smaller cysts without the knowledge of the patient because of the absence of symptoms to indicate the same. The rent in the cyst-wall usually heals and the cyst refills. In some cysts the rupture is repeated time after time, as evidenced by the number of scars found in the cyst-wall after removal. The *predisposing causes* of rupture are thinning of the walls from overdistension, fatty or other degenerative changes, suppuration or thrombosis, and the erosive action of papillary growths, which literally eat their way through the walls. Many cysts are weak-walled from the beginning, and it is from this contingent that the larger number of ruptures are realized. The *exciting causes* are usually a blow or fall or pressure on the cyst-wall. When the cyst-wall has become attenuated and weakened, a very slight impulse will be sufficient to determine the rupture. Sneezing, coughing, vomiting, turning in bed, coitus, straining at stool, and the manipulations incident to a physical examination are among the most common of the exciting causes.

Results.—Rupture of the ovarian cyst is usually devoid of danger, for the reason that it is apt to occur in the simple, thin-walled cyst with bland contents. Under other conditions the rupture may be fraught with direst consequence. Where the escaped fluid is bland and unirritating it is absorbed by the peritoneum and expelled by the kidneys. An active diuresis in proportion to the amount of fluid contained in the cyst always follows the intraperitoneal rupture. The

expelled fluid is pale and limpid, and when the cyst is large may be phenomenal in quantity. When the fluids are acrid or poisonous, as in the suppurating or dermoid cyst, peritonitis and toxemia are almost sure to follow, with a fatal result. The escaped contents of a cyst may infect the peritoneum with a growth similar to that of the cyst from which they escaped. Thus, escape of the contents of the papillomatous cyst may be followed by papillary growths of the peritoneum, those of the colloid cyst with colloid growths, and those of the dermoid cyst with dermoid growths. Hemorrhage following rupture of the cyst is seldom profuse, for the reason that the rupture usually occurs at a point where the walls are thin and comparatively free from vessels. Rupture from violence may, however, be followed by alarming or even fatal hemorrhage. Occasionally the cyst will rupture into the bowel or bladder, or in some of the other directions spoken of under "Inflammation" of the cyst, in which event the contents will be discharged directly from the viscus into which the rupture has occurred.

Symptoms.—In the majority of instances the rupture occurs without pain, vital depression, or any other systemic disturbance. If the cyst be of any considerable size, there will follow an appreciable or even marked diminution in the size of the abdomen, preceded and accompanied by an active diuresis. Through the collapsed and flaccid abdominal walls the residual cyst-wall may often be palpated with great distinctness. Should the cyst be ruptured by violence, there may be great pain, faintness, and evidences of internal hemorrhage. Rupture of the septic cyst will be followed by the vital depression and grave symptoms of an oncoming peritonitis.

CHAPTER XXXVIII.

CLINICAL HISTORY OF OVARIAN CYSTS.

THE clinical history will depend largely upon the situation, size, and character of the growth. The papillomatous cyst presents a different history from the glandular, and the intraligamentous from that which occurs free in the peritoneal cavity. These differences have been foreshadowed in the preceding pages, and it only remains to call attention to the most salient features of each.

Symptoms.—Small or moderately developed ovarian cysts are often devoid of any symptoms sufficiently marked to attract the patient's attention. It is by no means unusual to find a patient with an ovarian cyst of which she had neither knowledge nor suspicion. Large cysts will, of course, force themselves on the attention of the patient, and usually make themselves felt by crowding upon the stomach and lungs. Intraligamentous cysts, by reason of their confined position, are apt to give rise to pressure symptoms at an earlier date. They may press upon the rectum, giving rise to mechanical constipation, hemorrhoids, or dystenteric symptoms; upon the bladder, giving rise to irritable bladder or retention of urine; and by pressure upon the ureter produce ureteral obstruction and nephrodrosis. Disablement of the kidneys as the result of compression of the ureters and direct pressure of the larger tumors is a very common accompaniment of the neglected cystic growths of the ovary. In a series of forty autopsies on such cases Doran found the kidneys diseased in four-fifths of them.

Another very common symptom of the intraligamentous growth, whether it be cystic or solid, is menorrhagia. This is due to pressure on the large veins emerging from the uterus and the interference with the return of blood from the same. Pain is seldom a prominent symptom of the ovarian cyst, and is often entirely absent. When present it is due to pressure, inflammation, or some of the accidents to which the cyst is subject. Ascites occasionally occurs as the result of mechanical irritation of the peritoneum, occasioned by the presence and mobility of the tumor. It is seldom a prominent symptom except in the papillomatous variety. Here it arises from the intrinsic irritating properties of the escaped contents of the cyst. Pronounced ascites

occurs in malignant degeneration of the cyst. The ascitic fluid in such cases is apt to be dark, and frequently bears a close resemblance to prune-juice. In large cysts pressure on the veins may produce edema of the lower extremities and lower portion of the abdomen. The uterus—though often displaced backward or forward, upward, downward, or laterally by the cystic growth—is not, as a rule, materially affected in its functional activities. Menstruation generally proceeds with regularity. Occasionally it is increased, as in the intraligamentous cyst, and less frequently diminished or absent. Pregnancy is by no means rare, and constitutes a complication of much gravity.

The rapidity of growth of the ovarian cyst varies within wide limits. Proliferating cysts are the most rapid of growth, and will sometimes enlarge appreciably in a few weeks' time. Papillomatous and dermoid cysts are usually of slow and limited growth. They will sometimes remain quiescent for long periods. Much difference as to the rapidity of growth exists even between cysts of the same character. The termination of cystic growths of the ovary, if undisturbed, is in death. The exceptions to this rule are so infrequent as to be unworthy of consideration, and should under no circumstances be taken as an argument against operative interference. Taking into consideration the variable rapidity of growth, it is impossible to predicate the duration of life in any given case. The average life of the woman with a proliferating ovarian cyst is about two or three years from the date of its first appearance as an abdominal growth. Some cysts will grow so rapidly as to terminate life in a much shorter period. Slow and measured growth of the cyst will sometimes establish a tolerance which will enable the patient to survive a degree of development far beyond that which would have been tolerated had the growth been more rapid. It is from such cases that are derived the records of enormous cystic development and longevity of the patient which form such an interesting chapter of earlier history. I have known patients to be alive twelve to fourteen years after the cyst had been recognized. Such cases, however, are extremely exceptional.

Cysts which have been tapped refill rapidly. In times agone, when tapping was the only surgical resource, the records teem with instances of remarkable recuperative energy of cysts from which the contents have been withdrawn by tapping. In one case nearly 10,000 pounds of fluid were withdrawn in successive tappings. Simple cysts may disappear after tapping or rupture, though, as a rule, the breach

is healed and they refill. The proliferating cyst always refills. Death is the result of impaired appetite and digestion, sleeplessness, and interference with respiration and circulation. Nephrodrosis and impairment of the kidney may contribute to the fatal result. Death may sometimes be precipitated by one of the accidents to which the cyst is subjected, such as torsion of the pedicle, rupture, and suppuration of the cyst.

Methods of Examination.—The means employed to determine the presence of an ovarian cyst and to differentiate it from other conditions which may simulate it are: inspection, palpation, percussion, and auscultation.

It is important that the patient should be prepared for the examination by a preliminary evacuation of the bowels and bladder. The clothing should be removed or loosened and so disposed as to admit of the untrammeled use of all the means of examination. Small pelvic cysts which have risen into the abdomen may be examined bimanually. The typical uncomplicated ovarian cyst is spherical, and presents a smooth or lobulated surface according as it is simple or conglomerate. The cyst may be located in front, back of, or at either side of the uterus. In most instances it has fallen down into Douglas's pouch. If the cyst be pedunculated, it is distinctly movable, the range of motion depending on the length of the pedicle. It may sometimes be pushed up into the abdomen or moved from side to side within an extensive radius. These movements are independent of the uterus, and indicate that the tumor has no intimate relation with it. If the cyst be intraligamentous it is neither so distinctly spherical nor movable, and is in more intimate relation with the uterus. It is not often that fluctuation can be detected in the small ovarian cyst, but they possess an elasticity which to the experienced touch is quite characteristic. Dermoid and papillomatous cysts are less elastic and more boggy. The uninflamed cyst is comparatively insensitive, and may be handled freely without eliciting pain.

In most instances it is not possible to distinguish between the different cystic formations, nor yet is it material, as all alike should receive the same treatment. The cyst may be distinguished from diseased uterine appendages by the history, which excludes pelvic inflammation; by the spherical shape, and by the absence of sensitiveness. The cystic tube is elongated, club-shaped, or coiled. It may be distinguished from the uterine fibroid by its regularity of outline, its greater elasticity, and by its dissociation from the uterus, as indicated by its independent movements. An inflamed, adherent, or imbedded

cyst may cloud the diagnosis or make differential diagnosis impossible. In such cases the patient should be given the benefit of the doubt and the case treated on the supposition that the tumor is cystic.

In cysts which have escaped from the pelvis or grown up into the abdomen, additional methods of examination are required. The woman is placed on her back with her thighs flexed and the abdomen exposed. The extremities and genitals should be covered with a sheet. In lax or thin-walled women the position of the cyst is indicated by a mound-like elevation or prominence. Cysts of medium size usually occupy the middle of the abdomen, though cysts of this or smaller size may be located distinctly on one or the other side. When a cyst is located on one side of the abdomen it is usually taken as an indication that it sprang from the ovary of the corresponding side. The rule will hold good in many cases, but is by no means infallible, as a long pedicle may easily allow of displacement to the opposite side. By palpation the general character of the surface may be determined, which will be smooth and spherical in the unilocular cyst, and lobulated and perhaps irregular in the multilocular cyst. By placing the hand on one side of the cyst and gently tapping the other with the tips of the fingers, fluctuation will be elicited. If the cyst be unilocular, the fluctuation wave is distinct; if multilocular, the wave is shorter and less distinct and sometimes inappreciable. In women with fat abdominal walls the movement imparted to the semifluid fat by percussion will often so closely resemble the percussion wave of the cyst as to be indistinguishable from it. This may be eliminated by forming an artificial diaphragm in the abdominal wall. This may be done by directing an assistant to apply the ulnar edge of the hand to the surface of the abdomen midway between the percussing finger and the hand opposite, and make firm pressure. This arrests the fat-wave or any other that may be communicated through the abdominal wall, so that any impulse perceived is known to arise from the agitation of fluid in the peritoneal cavity. The same result may be secured by percussing across the umbilicus from side to side or in a longitudinal or diagonal direction.

Aside from the fluctuation wave, which is elicited and recognized by a combination of percussion and palpation, percussion is the most reliable means of determining the presence of an ovarian cyst. Where the abdominal walls are thick and firm, or where the cyst fills the abdomen, it is indispensable and gives more information than all other methods combined. By it the cyst may be definitely outlined and its size and situation accurately determined. The percussion note

over the cyst is dull, while that of the unoccupied space is resonant, such as would proceed from the stomach or intestines. The intestines are usually crowded upward and to the sides; consequently the resonant area of the abdomen is in outline something like a horseshoe with the convexity upward. In very large cysts the resonant area is confined to the upper portion of the abdomen and to one flank. (Fig. 265.) The relative positions of the dullness and resonance are never changed by positions of the body or other cause.

Differential Diagnosis.—There are many conditions of the pelvis or abdomen which to outward appearance more or less resemble the ovarian cyst, and which have on occasion been mistaken for it. Usually it is not difficult to distinguish between them; nevertheless there are isolated cases in which the differentiation is extremely diffi-

Fig. 265.—The Dull Area of an Ovarian Cyst. (Author's Case. Drawn from a Photograph.)

cult or impossible. In some of these it is of the utmost importance that a correct diagnosis be made; in others, a mistaken diagnosis will be of technical rather than practical import, and will be burdened with no serious consequence. To mistake the pregnant uterus for an ovarian cyst may be fraught with the most disastrous consequence, whereas if a pus-tube is mistaken for an ovarian cyst no serious result is likely to ensue, as the same treatment would be indicated for both. Happily the conditions demanding differentiation are, as a rule, capable of solution. Pregnancy, obesity, tympany, or other condition in which operation would be uncalled for can usually be differentiated with absolute certainty, or at least they invest the question with so much uncertainty as to stay the hand of the cautious surgeon until the doubtful features of the case can be eliminated. Happily, also,

the greatest difficulties are encountered in differentiating the ovarian cyst from other pathologic conditions in which the treatment indicated for one would be applicable to the other. It matters little whether the abdomen be opened for an ovarian cyst, inflamed appendages, or broad ligament cyst, or whether it be a papillomatous, dermoid, or glandular cyst, as all alike demand operation by abdominal section.

Among the more common conditions with which an ovarian cyst may be confounded are: pregnancy, uterine atresia with retention of fluids and gases, uterine fibroid, ascites, fecal impaction, phantom tumor, distended bladder, mesenteric cyst; cysts of the liver, kidney, and spleen; and desmoid cysts.

In attempting the differential diagnosis of the ovarian cyst from other conditions which may simulate it, first ascertain if the growth is of pelvic origin: if it springs from the pelvis and is attached to the pelvic organs. If of pelvic origin, the next question is to determine the organ from which it developed. If this cannot be determined with ease or certainty, it will be necessary to proceed with the search systematically. As the womb is the most accessible organ in the pelvis, the examination will usually begin with this.

Locate the uterus, and if possible map it out, and especially seek to establish its connection with or independence of the growth. For this purpose every known method should be resorted to: bimanual examination with fingers in the vagina or rectum, dragging down the uterus with a volsellum while the rectal finger explores its surface and determines its relation to the growth (Hegar's test), noting the effect of movements of the uterus on the tumor or of movements of the tumor on the uterus; if they move in concert the growth springs from or is attached to the uterus; if a movement imparted to one is not communicated to the other, they are independent. This may be designated as the movement test. The greatest range of movement may be obtained by pulling down on the cervix or lifting up on the tumor. An attempt should be made to locate the ovaries; if both ovaries can be located, the tumor is obviously not ovarian.

Pregnancy.—One of the most frequent errors, as well as the most serious, is to mistake the pregnant uterus for an ovarian cyst. This mistake has not only occurred to the inexperienced, but too often to the schooled diagnostician. It is usually the result of overconfidence, though cases are encountered which, for a time at least, baffle the skilled diagnostician. In differentiating between pregnancy and the ovarian cyst the history of the case should be well considered. The development of the growth is more rapid in pregnancy, and is usually

attended with the symptoms peculiar to that condition: suppression of menstruation, nausea and vomiting, and other reflex disturbances. It should not be forgotten, however, that these are not always present in pregnancy. An attempt should be made to outline the uterus by bimanual examination, and to separate it from the tumor. Softening of the cervix (Hegar's sign), periodical contraction, quickening, fetal movements, heart-sounds, may all or severally by their presence or absence help to solve the problem. In case of doubt wait, examine, and re-examine at monthly intervals until pregnancy is affirmed or excluded. Operation for ovarian cyst may well be deferred in the face of such a grave responsibility, even to the completion of gestation, though this will seldom be necessary. Unmarried women who have been guilty of indiscretion will not infrequently deny the knowledge or possibility of pregnancy, and will even submit to operation rather than admit their guilt, or with the hope of ridding themselves of the evidences of it. In examination for ovarian cyst the possibility of pregnancy should always be uppermost in mind, and no diagnosis made nor action taken until this condition can be excluded. Pregnancy may complicate an ovarian cyst which may or may not have been known to exist. With the increased vascularity incident to pregnancy the growth becomes greatly accelerated. The rapid increase in the abdominal enlargement, with the usual phenomena of pregnancy will cause the patient to seek medical counsel, when by careful examination the condition will be disclosed. In many respects the external evidences of *hydramnios* are similar to those of an ovarian cyst. A cystic body can be detected in the peritoneal cavity, and fluctuation is often quite distinct, which is not the case in the normally pregnant uterus. In hydramnios pregnancy usually pursues a normal course up to the sixth or seventh month, when there is a rapid and inordinate enlargement of the abdomen. The history of the case, together with the softened or obliterated cervix, the patulous canal, and the presence of the fetal membranes easily accessible through the open os will leave little doubt as to the nature of the case.

Uterine Atresia, with Retention of Fluids and Gases.—Distension of the uterus with blood, pus, or gas will be wanting in the signs or symptoms of pregnancy, and upon investigation the cervical canal will be found occluded. The tumor will occupy the position of the uterus, or, if displaced, the absence of the uterus of recognizable form will suggest the nature of the body.

Uterine Fibroid.—The uterine fibroid seldom occurs before the thirtieth year, and gives a history of slow development. It is often

irregular in outline, firm, heavy, and non-fluctuating. Its continuity with the uterus can usually be determined by bimanual examination. Movements of the tumor are communicated to the cervix, and *vice versa*. In the submucous and interstitial forms menorrhagia is a frequent symptom. Here, also, the uterine sound will reveal the increased depth of the uterus. Auscultation reveals a blowing sound. In the subperitoneal fibroid the depth of the canal may not be materially increased, but connection of the tumor with the uterus may be determined by movements imparted to one by dragging on the other, and by rectal exploration of the tumor and pedicle while the uterus is forcibly drawn down. The edematous, pedunculated fibroid is regular, soft, and semifluctuating, and is most apt to occur in the

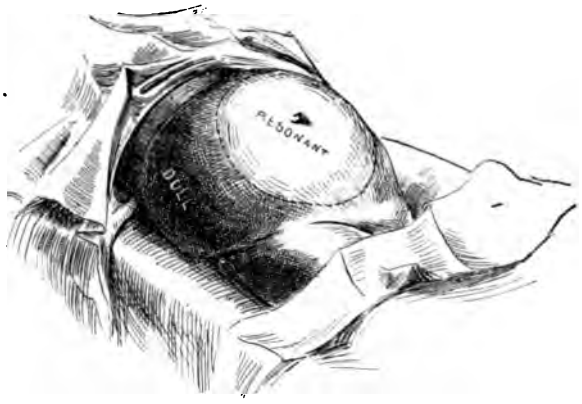


Fig. 266.—Ascites, Showing Resonant and Dull Areas.

young. Such a case is often quite impossible to distinguish from the multilocular cyst or the cyst with viscid contents.

Ascites.—In ascites the fluid is free in the peritoneal cavity, and unless the cavity be full to repletion there is less tension and resistance to the palpating hand. By pressure it is displaced, and the abdominal walls may be depressed here, there, and elsewhere with little effort. If the patient lie on her back, the abdomen does not preserve its dome shape, as in the case of the cyst, but flattens and bulges at the sides. (Fig. 266.) Percussion will elicit resonance over the summit of distension and dullness over the sides and flanks. This is exactly the reverse of what occurs in the ovarian cyst. The resonance at the highest level in ascites is due to the gas-filled intestines floating to the surface of the fluid. (Fig. 267.) If the patient be placed on one side

or the other, or in the sitting posture, the fluid will always gravitate to the lowest level and the intestines float to the surface; hence the zone of resonance and dullness changes accordingly. (Fig. 268.) In the ovarian cyst there is no change. (Fig. 269.) Where the abdomen is greatly distended with fluid the mesenteric attachment

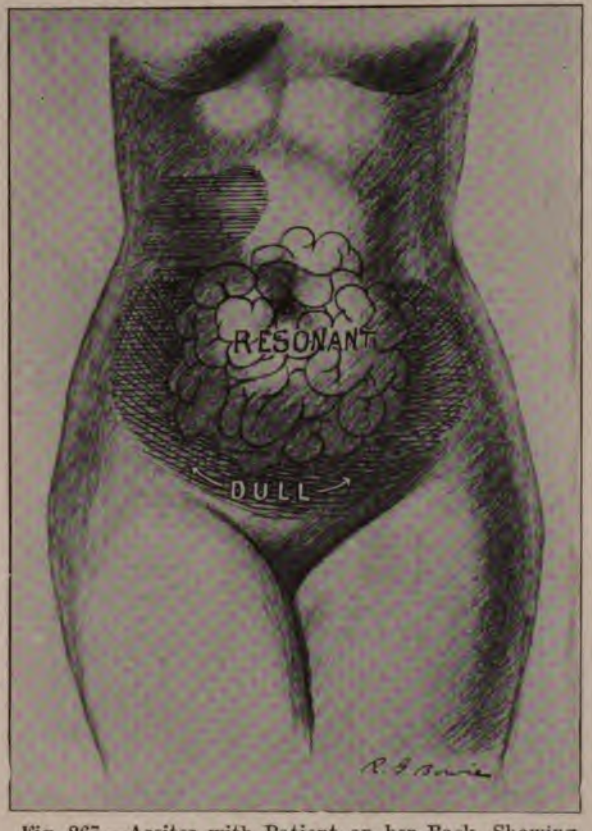


Fig. 267.—Ascites with Patient on her Back, Showing Resonant and Dull Areas.

may be too short to allow the intestines to reach the surface. Here, by depressing the abdominal wall and displacing the surface fluid, the intestinal resonance may be elicited. In the large ovarian cyst the resonant area is confined to the epigastrium and one flank. (Fig. 270.) In case of encysted or pocketed ascites it may be impossible to make a positive diagnosis without exploratory incision. Usually, how-

ever, there will be less regularity of outline, and a change of form from time to time which, taken in connection with the history of the case, may lead to diagnosis. The condition is the result of chronic peritonitis, and is most frequently tubercular in character. Ascites complicating the ovarian cyst will present the general characters of ascites

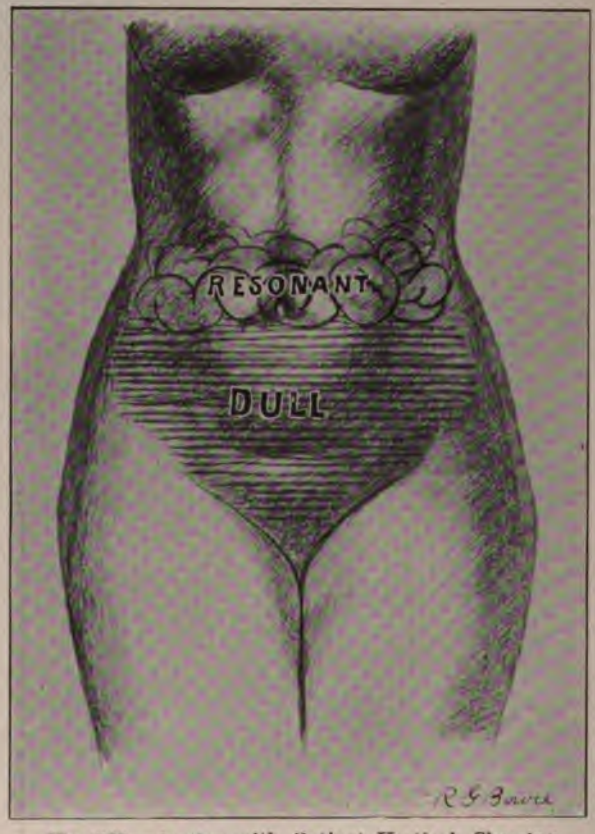


Fig. 268.—Ascites with Patient Vertical, Showing Resonant and Dull Areas.

plus those of the cyst. The tumor may be palpated by displacing the free fluid. An ovarian cyst filled or partly filled with gas will be resonant on percussion, but will preserve its shape and may be recognized by palpation.

Fecal Impaction.—An accumulation of hardened fecal matter in the bowel sometimes forms a mass of such magnitude as to present

the aspects of a tumor. An impaction of the transverse colon may, by its own weight, descend into the lower abdomen. They are to be distinguished by their less regular outline, their doughy consistence, by the fact that they may be molded or permanently indented, and finally by their disappearance under purgation.

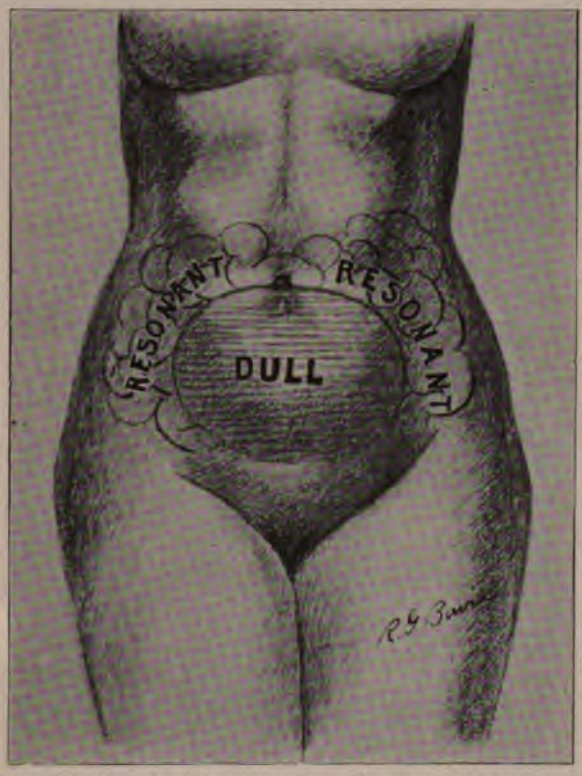


Fig. 269.—Medium-sized Ovarian Cyst, Showing the Dull Area in the Center and the Crescentic Area of Resonance at the Top and Sides.

Tympany, or Phantom Tumor.—The phantom tumor is the result of gaseous distension of the abdomen, and is usually associated with a morbid fear of or desire for pregnancy. It is most apt to occur just before the climacteric. It is attended by many of the subjective symptoms of pregnancy, but in some cases these are absent, and the condition has been mistaken for an ovarian cyst. The percussion note will be tympanitic and palpation negative. Careful examination of

the pelvic viscera through the rectum will disclose the absence of a tumerous formation connected with the uterus or appendages. The tumor vanishes under etherization, to return when the patient recovers from its effects.

Distended Bladder.—This in many respects resembles an ovarian cyst. It is distinctly cystic and fluctuating, and occupies the position

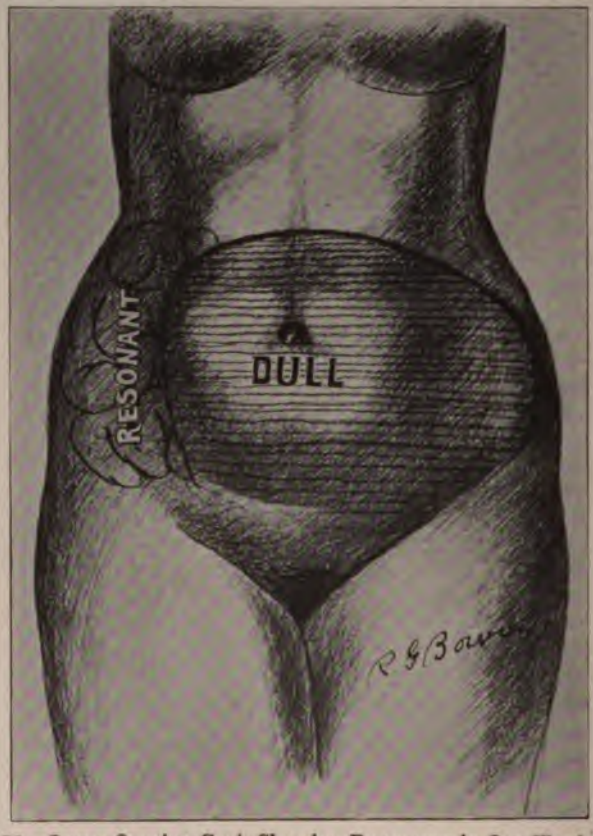


Fig. 270.—Large Ovarian Cyst, Showing Resonance in One Flank Only.

of the ovarian cyst. It is, however, more ovoid and elongated in an upward direction, is more distinctly prominent at its pelvic pole, and is usually quite tender and associated with more suffering and constitutional disturbance. There is also frequently an overflow of urine from the bladder, which keeps the patient wet, and, as in many in-

stances the retention is mechanical, the pelvis will be found impacted with a fibroid, a cyst, or a retroverted pregnant uterus. The possibility of a distended bladder should always be borne in mind, and where the least suspicion exists the viscus should be emptied by the catheter. In most instances of this kind the ordinary female catheter is neither long enough nor of the proper curvature to reach the cavity of the bladder, and a male catheter should be used. From lack of this precaution I have known the bladder to be cut down upon even after the ordinary female catheter had been used on the table.

Retroperitoneal Cysts.—Such cysts, taking their origin in the pelvic region, will be distinguished by their fixedness, and by the fact that a finger in the rectum will show them to be behind instead of in front of it. Cysts developing from the abdominal cavity or upper zone of the abdomen when small may usually be differentiated by their position and absence of attachment to the pelvic viscera. As a rule, those emanating from the liver, spleen, or kidney will give a history of having developed from the region of those respective organs in a direction downward and toward the median line. The intestines will be crowded before them and the resonance will be in the lower abdomen and on the side opposite to that from which the growth sprang. They sometimes prolapse into the pelvis and apparently grow upward. This may make the diagnosis impossible. Where both ovaries can be found independent of the growth, ovarian cyst may be excluded. The hydatid cyst crepitates under pressure; cysts of the kidney grow up under and push the colon inward in front of them, which is resonant on percussion; and splenic tumors have an association of malaria or leucocythemia.

Obesity.—An accumulation of fat in the abdominal wall and omentum has frequently been mistaken for an ovarian cyst. Small cysts may co-exist with this condition and be difficult of detection. Much fat in the abdominal wall is incompatible with large cysts, as they produce atrophy and thinning of the wall. The inordinate thickness of the abdominal walls may be demonstrated by grasping them in the hand. The fat abdominal wall becomes pendulous in the erect position and lurches to the side upon which the patient is reclining. Percussion yields a muffled resonance, and the fat-wave may be eliminated by creating an artificial diaphragm.

Desmoid Tumors.—These are growths in the abdominal wall springing from the intermuscular connective tissue or fascia, and if large so as to cover the greater portion of the abdominal wall may be very puzzling. The tumor is rotund and resistant, and rises

abruptly from the abdominal surface. Its intimate relation to the walls may be determined by working the fingers under the margins of the growth and moving it about; it always goes with the wall and draws the wall with it. The vaginal and rectal touch may determine its independence of the pelvic organs and may develop its extra-peritoneal situation.

CHAPTER XXXIX.

OVARIOTOMY—ACCIDENTS AND COMPLICATIONS.

THE only rational treatment for the ovarian cyst is its complete removal, which is denominated ovariotomy. Tapping, once so much in vogue, is now without sanction or excuse. It never cures except now and then a simple cyst, and the dangers are manifold without any compensatory advantages. Strong adhesions form at the site of tapping, greatly increasing the difficulties of operation; large vessels may be punctured, giving rise to serious, if not fatal, hemorrhage; the cyst contents may escape into the peritoneal cavity, which, in the case of the papillary cyst, may infect the peritoneum or in the suppurating

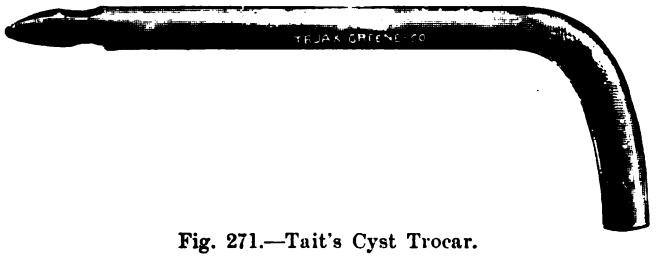


Fig. 271.—Tait's Cyst Trocar.

or dermoid cyst give rise to fatal peritonitis. In case of enormous development of the cyst, such as is occasionally found in the proliferating glandular cyst, where respiration and circulation are so seriously interfered with as to invest the operation with special risk, it may be allowable to draw off the fluid in whole or in part, that the patient may have a few days of respite and the impaired functions restored to something like the normal.

OVARIOTOMY.

Ovariotomy for an uncomplicated, pedunculated cyst is one of the easiest of major operations. After due preparation with special regard to sepsis, the bladder having been emptied and the alimentary canal purged, the patient is etherized and placed on the table. The lower extremities are enveloped in blankets and covered with a steril-

ized sheet. The night-dress is drawn up under the shoulders to prevent soiling, and the chest protected by suitable covering. The abdomen is bared and vigorously scrubbed with alcohol, and a sterilized sheet, with an opening through which to work, thrown over all.

The peritoneal cavity is entered through a short incision in the median line midway between the umbilicus and pubis. The glistening surface of the tumor now presents, into which is thrust an ovarian trocar. The trocar should be entered nearer the upper than lower angle of the incision, as with the escape of contents the sac settles toward the pelvis. A rubber tubing should be attached to the trocar of sufficient length to conduct the fluid into a catch-basin beneath or

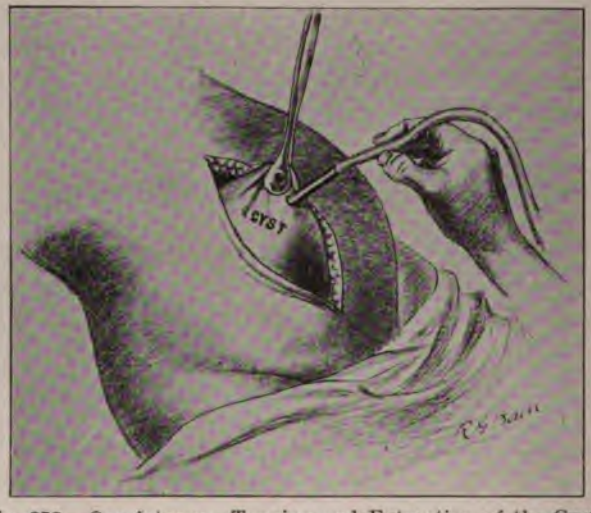


Fig. 272.—Ovariotomy: Tapping and Extraction of the Cyst.

at the side of the table. (Fig. 272.) An assistant should keep the abdominal walls at the edge of the incision in close contact with the cyst to prevent entrance of the contents into the peritoneal cavity. This can be done by hand pressure with a towel intervening. As the tension of the sac diminishes with the loss of fluid, it is caught up on either side of the trocar with volsella or other suitable forceps and drawn out. Little by little it emerges through the opening until it finally escapes, disclosing the pedicle. The sac, being wrapped in gauze or sterilized towel, is now held by an assistant while the pedicle is transfixed by a strong ligature and tied. (Fig. 274.) It is safer to carry the ligature through double, remove the carrier, divide the

ligature into equal lengths, and tie each half of the pedicle separately, and as a *finale* one of the ligatures may be carried around the entire pedicle and tied again. The sac is now cut away, being careful to leave sufficient button to prevent the slipping of the ligatures. Some operators first apply a compression forceps to the pedicle, and after removal place the ligature in the groove produced by it. This gives greater security against secondary hemorrhage. The opposite ovary should now be examined for evidences of disease, and dealt with as conditions may indicate. After noting that there is no hemorrhage from the pedicle, and sponging away any fluid or blood that may have escaped into the peritoneum, the abdominal wound is closed, the dressings applied, and the patient put to bed. If this were all of ovariotomy it would rank as one of the simplest and easiest of operations. It is the witnessing of such cases that fires the novice with a desire to

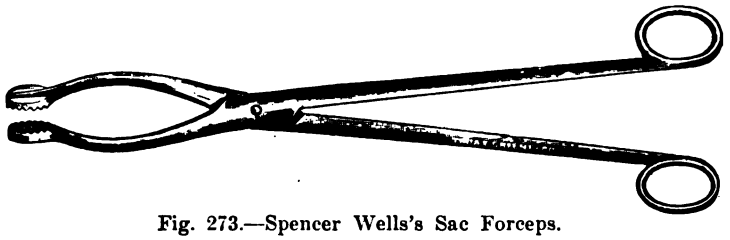


Fig. 273.—Spencer Wells's Sac Forceps.

become an abdominal surgeon, and too often incites him to undertakings for which he is unfitted.

Complications.—The complications of ovariotomy are numerous and varied and sometimes most embarrassing. One of the most frequent of these arises from the *atrophy* of the *abdominal walls.*

Mistaking the Omentum for Properitoneal Fat.—In case of atrophy and disappearance of the properitoneal fat the peritoneal cavity has been entered unawares and the omentum mistaken for it and boldly incised. The greater vascularity of the omentum, together with the fact that its vessels run vertically, while those of the fat and fascia run transversely, will serve to distinguish them. Usually, however, the distinction is much more readily made by drawing out the omentum or by introducing a finger and sweeping it around in the peritoneal cavity. Close adhesion between the cyst and the atrophied abdominal wall result in the effacement of all lines of distinction between the layers and lead to embarrassment in the operation. In such cases the peritoneum has been stripped from the abdominal

wall under the impression that the cyst was being separated. If the operator does not discover his mistake before, he will come to a line on the lateral aspect of the abdomen where the peritoneum is closely adherent and will resist all ordinary attempts at further separation. In all cases where doubt exists, the incision should be carried up to the umbilicus, where the cyst and abdominal wall seldom coalesce, from which point the work of breaking up adhesions may proceed. By feeling one's way carefully after going through the skin, lifting up layer by layer with mouse-toothed forceps, and carefully incising, the surface of the cyst may often be reached and recognized by the compactness of its structure, which differs radically from the lami-

Fig. 274.—Ovariotomy: Tying the Pedicle.

nated and web-like structure of the connective tissue remains of the properitoneal fat. Where these methods fail, the cyst may be incised and the contents let out, and an attempt made to deliver it by inversion. To invert the cyst a hand should be thrust into the cyst-cavity, with which the posterior wall is seized and drawn out through the incision, thus completely turning it inside out.

Delivery of the Multilocular Cyst.—In multilocular cysts after emptying the main cyst, the trocar, guided by the hand, may be thrust into one after another of the contained cysts until the tumor is so far reduced in size as to admit of delivery. These secondary cysts may quite often be broken down by the hand introduced into the cyst-

cavity. Where the contents are viscid, the trocar may be dispensed with, the opening enlarged, and the cyst emptied by hand or external pressure. Dermoid and papillomatous cysts, as also infected cysts of small or medium size, should be removed entire by making liberal section of the abdominal wall.

Adhesions.—Light adhesions may be broken up by introducing the hand into the abdominal incision and sweeping it over the face of the tumor. Dense adhesions would better be dealt with under the eye when practicable, by drawing them up to the opening after the cyst has been emptied. The sponge is often of great assistance in separating adherent surfaces, but should be used according to rule. The rule is to sponge off the delicate structure from that which is less delicate. The cyst-wall should be pushed off from the abdominal wall; in adhesions to the viscera, the latter are sponged or coaxed off of the cyst, being careful to preserve the integrity of the viscus at the expense of the cyst, if necessary. In some cases, to prevent injury to the

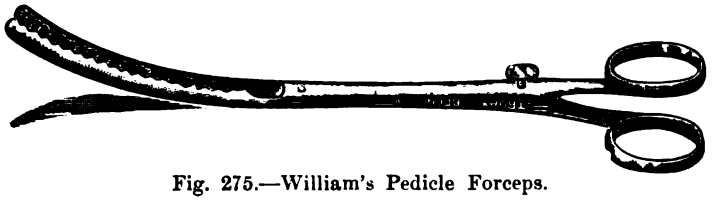


Fig. 275.—William's Pedicle Forceps.

intestines or other important organs, no attempt should be made to break up the adhesions, but the attached portion of the cyst-wall should be excised and left. The inner secreting surface of the excised portion should be destroyed by cautery or otherwise, and when practicable folded upon itself and stitched. Very dense adhesions in the form of bands or bridles may require the use of scissors. Where there is reason to suspect vascularity, they should be cut between pressure forceps or ligatures.

Pedicle.—Where the pedicle is of unusual breadth, it should be tied in sections. In lieu of this, and in many respects preferably, the ovarian artery may be tied external and internal to the pedicle, which will as effectually control the hemorrhage. After cutting away the cyst the stump of the pedicle is whipped over with catgut, which serves the double purpose of stanching any bleeding from small aberrant vessels and of closing in the raw surface.

Intraligamentous Cysts.—In some intraligamentous cysts which project well into the peritoneal cavity, a pedicle may be formed by

traction on the cyst, in which case it may be dealt with as a pedunculated growth. The parovarian cyst may be delivered by incising the peritoneum at a convenient place and then stripping it off. The proliferating intraligamentous cyst may be enucleated by cutting through the peritoneum on a level with the pelvic brim posteriorly and rolling it out of its bed from below upward. (Fig. 276.) All bleeding points are secured by forceps and subsequently tied. A general oozing may be controlled by gauze packing. (Fig. 277.) Should it be necessary to drain, an opening may be made into the vagina through which a gauze drain may be carried. Should there be no bleeding after ligating the vessels, the gap in the broad ligament may be closed with

Fig. 276.—Enucleation of the Intraligamentous Ovarian Cyst.

catgut suture. A bloodless operation for the intraligamentous cyst has been devised by Hall, of Cincinnati. He first taps the cyst and draws off its contents, then ligates the ovarian artery near the pelvic wall on both sides. He now proceeds as in supravaginal hysterectomy, ligating and cutting on the side opposite the cyst until the cervix is reached. The bladder having been stripped off and the uterine artery secured, he cuts across the cervix, catches up the uterine artery on the opposite side, and delivers the cyst from below upward. In women who for any reason are incapable of child-bearing this is the ideal method, as it gives perfect control of the hemorrhage. It is but just to say that Hawkins, of Denver, independently, and without foreknowledge of the Hall operation, adopted the same technique.

As illustrative of some of the difficulties occurring in ovariotomy and the manner in which they may be dealt with, I will give a case occurring in my practice on March 25, 1899. The patient, S. G., residing at Bethesda, Ohio, was 45 years of age, and had noticed the growth about thirteen years. She had one son seventeen years of age. She was referred to me by Dr. D. M. Murphy, of Bethesda, who in writing stated that the growth was of sixteen years' standing. When brought into the presence of the patient I must confess that I was surprised and disconcerted. As she lay in bed on her side with her back to the wall the tumor filled the bed, and as it quivered and vibrated with the respiratory movements, it presented a spectacle that I shall never forget. It was simply monstrous and inhuman. In its huge and tremulous expansiveness it reminded one of a mastodonic

Fig. 277.—Packing and Vaginal Drainage After Enucleation of an Intraligamentous Ovarian Cyst.

amniotic sac. A peculiar feature was the comparative laxity of the cyst and abdominal walls, which allowed it to flatten out and spread all over the bed, and it extended from high up on the chest to below the knees. The face, chest, and arms were emaciated to the last degree, while the lower half of the abdomen was knobby and indurated, as in elephantiasis. The lower extremities were truly elephantine in shape and appearance. She was examined lying on her side, as the pressure of the tumor on the diaphragm gave rise to suffocating symptoms. The percussion wave was strikingly distinct over all parts. She was helpless in bed, and it required the assistance of several persons to change her position. Nevertheless, if placed on her feet she could walk. (Fig. 278.)

On the day of her admission to the hospital, in attempting to change her position in bed the tumor gave a lurch and carried her

bodily to the floor. It required the combined efforts of several men and nurses to replace her in bed. She was tall, and of large frame, but, with the exception of the lower extremities, had wasted to a skeleton. She was of buoyant disposition and rather inclined to be jovial. I found her to be a woman of more than ordinary intelligence and shrewdness. She inquired with some show of concern whether the removal of the growth would be attended with danger. On being informed that it would, she expressed a wish to be tapped and sent home. I explained that tapping would be a measure of doubtful expediency, as the refilling of the sac would make such a draught on her vital resources as rapidly to exhaust them, and that the tumor would certainly kill her if it were not removed. She then said that she would leave the matter entirely in my hands. I told her that we would both consider it for twenty-four hours, as I confess that I had little hope of benefiting her. On my next call we agreed to operate, and she was in the best of spirits. She arrived in the city on Wednesday evening and the operation was set for Saturday morning. This was March 25, 1899.

She took the ether nicely and was placed on the operating-table on her side. The bulk of the tumor extended over the side of the table and had to be supported by an assistant. This assistant was relieved at short intervals, as the position was too irksome to be maintained for any length of time. An incision six inches long was made down to the sac, and revealed a thickened abdominal wall, consisting entirely of hyperplastic connective tissue. The cyst-wall was also thick and dense, and was with difficulty penetrated by the trocar. Thus, it will appear that the abdominal and cyst- walls had grown *pari passu* with the cyst accumulations, and that neither suffered from the pressure atrophy usually found in such cases. A large wash-tub was placed to receive the contents, which were of the color and consistence of very muddy water. The fluid left a greenish-yellow deposit on anything with which it came in contact. When the tub was nearly full it was removed, and a waste-water tub substituted. It required three of these besides the large wash-tub to receive the contents. These tubs were all removed to one side of the room, that no extraneous matter might find its way into them.

We now placed the patient on her back and attempted to break up the adhesions between the cyst-wall and abdominal parietes. These were found to be so dense and extensive that after working awhile I became convinced that the method was impracticable, and so opened up the cyst and attempted to deliver by inversion. In this I was

foiled, and began to fear that I should have to content myself with an incomplete operation, when suddenly well down on the left side the adhesions began to give, and from this point I was enabled to strip off the sac in all directions. The pedicle was broad, and was

Fig. 278.—Ovarian Cyst Weighing One Hundred and Seventy-six Pounds. (Author's Case.)

secured by a chain ligature. The cyst was cut loose and dropped into a receptacle. We now attempted to wash out the cavity, but the two gallons of water poured in disappeared as completely as though poured into a waste-pipe. I now saw that nothing short of a tub of water would avail to flush the cavity, and the attempt was abandoned. The

redundant tissues of the abdominal wall hung down on either side of the table and covered the thighs to the knees. The surface was thrown into innumerable folds and fissures, but the folds were much larger, and the wrinkling less conspicuous than in other large abdominal growths, because of the unusual thickness of the parietes. In attempting to sponge out the cavity I found pools of fluid in all sorts of out-of-the-way places. The wound was now closed, but in applying the bandage we found that, do what we would, a large pendulous mass extended down over the thighs.

The fluid contents of the tumor were now measured, a quart measure being used for this purpose. This was done by a Sister, supervised by the chief nurse. The count was made aloud and repeated by two censors and witnessed by several by-standers. There was no chance for deception or mistake. A quart of the fluid, exclusive of the vessel, was found to weigh two and one-fourth pounds almost precisely. Of this fluid there was seventy-five quarts and a fraction. The cyst-wall, with its residue, weighed a few ounces less than seven pounds. Altogether the tumor weighed a little more than one hundred and seventy-six pounds.

The patient did well from the first, although the pulse-rate continued at or about 100 for two weeks. The only trouble arose from the maceration and excoriation of the skin in the deep sulci between the contiguous folds, necessitating the use of cotton packing as a protective. There were present at the operation Dr. J. J. Magruder, chief of staff, who gave the anesthetic; Drs. E. M. Gilliam and C. F. Gilliam as assistants; Dr. Murphy, the family physician; Drs. W. R. Moore and E. M. Parret, as spectators, besides the Sister Superior and three nurses. This, so far as I can learn, is the largest ovarian cyst ever successfully removed in Europe or America. Reifsnyder reports one from China which weighed 182½ pounds.

ACCIDENTS AND COMPLICATIONS OF OVARIOTOMY.

Hemorrhage, sometimes of an alarming character, may occasionally occur from the cyst as the result of laceration or puncture of its vessels. In all such cases the pedicle should be sought and clamped immediately, as it is from this source that the tumor derives its blood-supply. Should the pedicle not be accessible, compression of the abdominal aorta and other temporary expedients for controlling hemorrhage may be resorted to until the pedicle can be reached. Bleeding of the surfaces laid bare by breaking up adhesions should

be met by ligature of all spouting vessels and gauze compression for oozing. Extensive denudation or injury of the uterus may call for hysterectomy. The abdominal cavity should never be closed upon a bleeding uterus. Injury of the omental vessels should never be lost sight of during operation, and should be followed by ligature and usually amputation of the distal portion. The omentum is treacherous, and vessels which have ceased to bleed on exposure to the air, or as the result of shock, are liable to give rise to debilitating, if not dangerous, hemorrhage after the abdomen is closed. Injuries to the small intestine, bladder, rectum, uterus, ureter, and other viscera may occur during operation. Injuries to the bladder or rectum may be

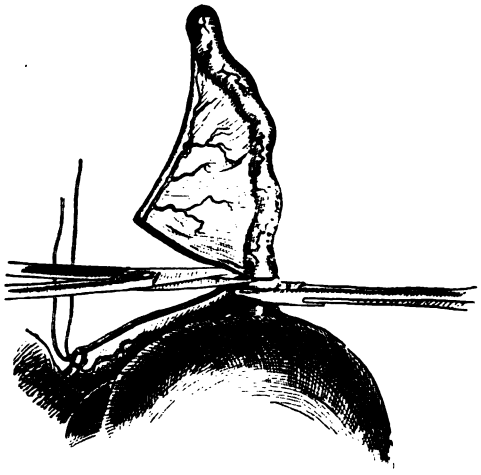


Fig. 279.—Appendicectomy: After Ligating, the Meso-appendix is Cut through and a Clamp Forceps Applied to the Root of the Appendix.

closed by suture, care being taken to avoid the mucosa. It is also important in all mucous-lined viscera to avoid suturing mucous surface to mucous surface, as they will not unite. Either the raw surfaces or peritoneal surfaces should be coapted. Injuries to the uterus may also be sutured, providing the hemorrhage can be effectually controlled, otherwise it is safer to remove the organ. Injuries to the small or large intestine or ureter may be closed by fine suture, or may demand resection and anastomosis.

Appendicectomy.—When in the course of an abdominal operation it becomes necessary to remove the vermiform appendix it may usually be done through the median abdominal incision already made. It is

a good plan in all abdominal operations, unless there be urgent necessity for rapid completion of the same, to examine the vermiform appendix. Should it not be readily located by the finger or eye it may be found by following down the longitudinal band on the ante-

Fig. 280.—Appendicectomy: a Purse-string Suture is Tightened Around the Inverted Stump of the Appendix.

rior aspect of the colon. The root of the appendix will be found at the termination of this band. When found it is brought to the opening, and if diseased should be removed. The meso-appendix is first tied off with a fine silk ligature, and the appendix liberated,

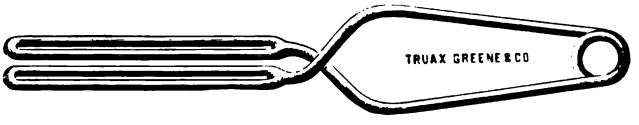


Fig. 281.—Knapp's Intestinal Forceps.

the scissors being carried along its attached border to its root, or where it merges into the bowel. A clamp forceps is now placed on the root of the appendix close to the bowel and the appendix cut away. (Fig. 279.) A purse-string suture is now run around the stump of the appendix in the outer coats of the bowel, the clamp removed, and

with a slender pair of forceps the crushed end of the stump is seized and inverted into the bowel. (Fig. 280.) The operation is completed by tightening and tying the purse-string suture, the forceps being

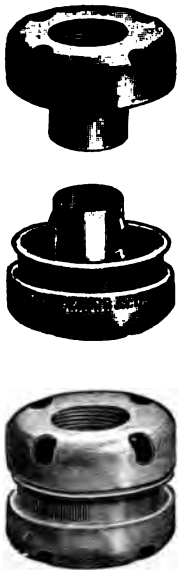


Fig. 282.—Murphy's Button.

Fig. 283.—Mayo's Intestinal Needles.

withdrawn as the suture is tightened. Some operators prefer complete excision of the appendix, closing the opening in the bowel in the way indicated above or by transverse sutures.

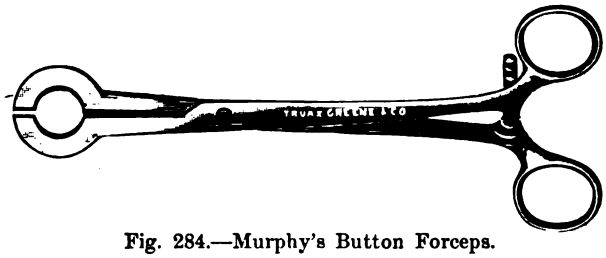


Fig. 284.—Murphy's Button Forceps.

Resection of the Bowel.—A diseased bowel may have to be resected. The portion of the bowel to be resected is drawn to or through the opening and sponges packed around it to prevent contamination of the peritoneum. The portion to be resected and for some distance on either end is freed from fecal matter by stripping the bowel be-

tween the thumb and finger. Strips of gauze are now passed through the mesentery and tied around the bowel at either extremity and just beyond that portion of the bowel to be excised, to prevent the escape of fecal matter. Some operators prefer intestinal forceps. The damaged portion of the bowel is now excised, including a wedge-shaped piece of the attached mesentery.

End-to-end anastomosis may be made either with the Murphy button or by suture. If the Murphy button be used, one of proper size is selected. A purse-string suture is made to encircle each open end of the bowel into which the separate segments of the Murphy

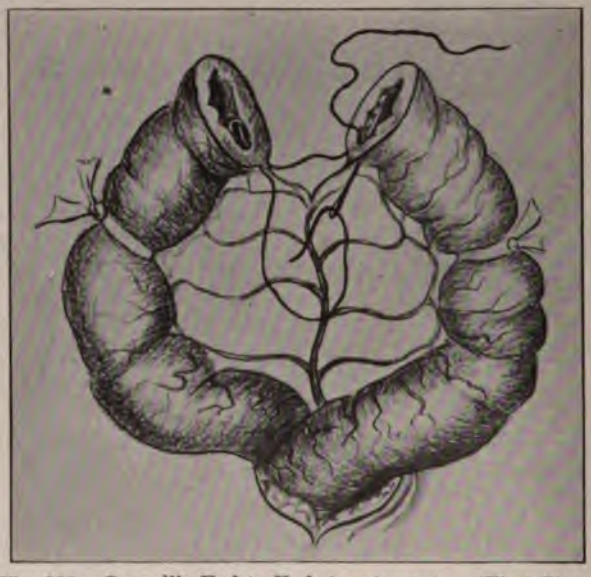


Fig. 285.—Connell's End-to-End Anastomosis. (First Step.)

button are introduced and the purse-string tightened and tied. The two halves of the button are now locked by pressing them firmly together. There are many methods of effecting end-to-end anastomosis of the bowel by suture, but none, probably, for efficiency and simplicity excels that of Connell, of Chicago. The weak point in end-to-end anastomosis is at the mesenteric attachment. Many failures have occurred and lives have been lost as the result of imperfect union at this point. Connell places his first suture here. The two ends of the bowel being placed side by side, so that mesentery touches mesentery, the needle enters on the mucous surface of one end of the bowel

on one side of the mesenteric attachment, passes directly through all the coats of both ends of the bowel, and emerges on the mucous surface of the other. It is now crossed to the other side of the mesenteric attachment, and by a reversal is brought back to the mucous surface from which it first entered. This forms a mattress stitch, which, when tied, brings peritoneal surface to peritoneal surface and the knot within the lumen of the bowel. (Fig. 285.) The ends of this suture are left long. Another suture is introduced to the right of this at a distance of one-third the circumference of the bowel, and the ends left long. Now, by seizing the ends of these two guy sutures and making traction, the bowel in the intervening space is drawn out into a straight

Fig. 286.—Connell's End-to-End Anastomosis. (Second Step.)

line and the peritoneal surfaces brought into snug contact, thus facilitating the introduction of other sutures. These sutures are of the same type and are about one-eighth of an inch in length and the same distance apart. They are cut short as they are tied. (Fig. 286.) After these sutures have been placed another guy suture is introduced one-third the circumference of the bowel to the left of the first. By seizing and making traction on the first and third guy sutures the intervening sutures are placed as on the right side. Sutures, one, two, and three are now cut short, and the bowel resumes its cylindrical outline with the suturing two-thirds completed.

In the remaining third, as it is impossible to bring serous coat

to serous coat and stitch from the inside of the bowel, the same result is obtained in a different way. By entering the needle on the mucous

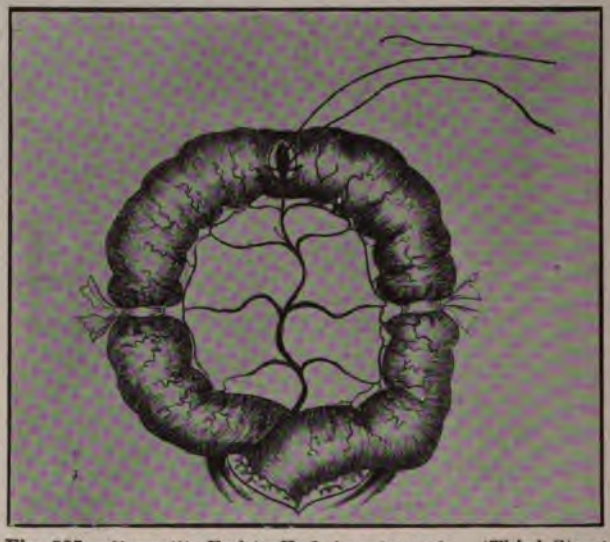


Fig. 287.—Connell's End-to-End Anastomosis. (Third Step.)

surface on one side and causing it to emerge on the serous surface, then carrying it across and entering it on the serous surface of the

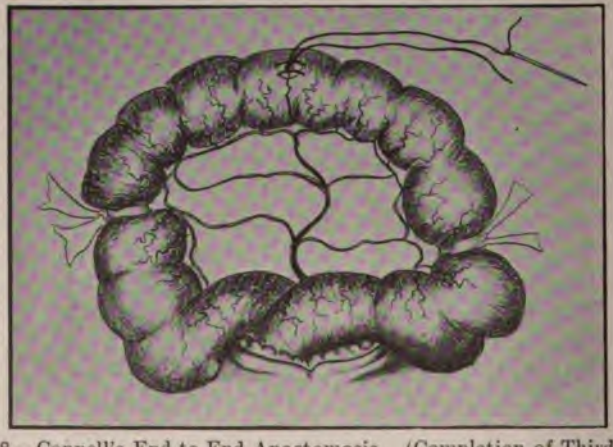


Fig. 288.—Connell's End-to-End Anastomosis. (Completion of Third Step.)

opposite side and causing it to merge on the mucous surface, the suture is half complete. Now entering it again on the mucous sur-

face of the same side one-eighth of an inch distant, bringing it out on the serous surface, crossing over and entering it on the serous

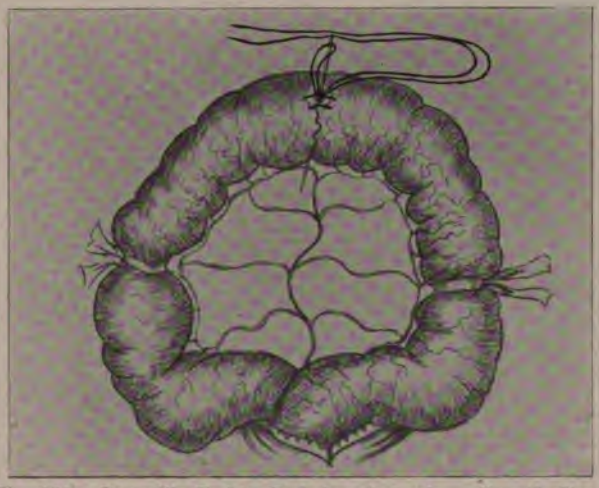


Fig. 289.—Connell's End-to-End Anastomosis. (Fourth Step.)

surface of the opposite side, and bringing it out on the mucous surface, the stitch will be complete, and when drawn and tied will bring

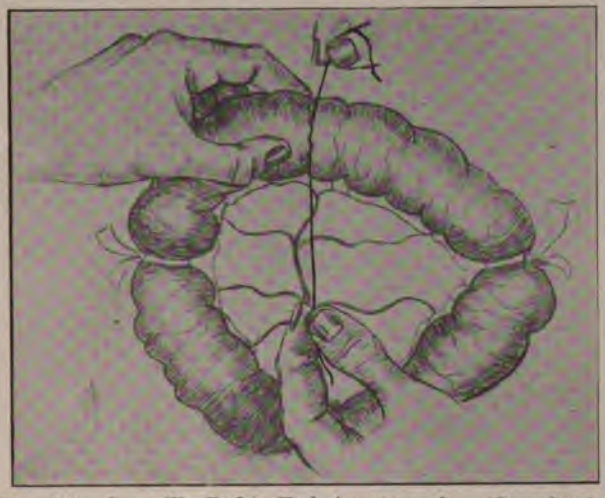


Fig. 290.—Connell's End-to-End Anastomosis. (Completed.)

the parts into the same relation as in the previous suturing. (Fig 287.) Other sutures are introduced in the same way. (Fig. 288.)

The last suture, however, cannot be tied on the inside of the bowel, and is managed in this way: After it has been introduced a needle armed with a thread is insinuated—eye end first—between the sutures on the opposite side of the bowel and brought out at the opening of the untied suture. Both ends of the untied suture are now passed through the loop of the thread or between the needle and thread and are drawn out on the other side of the gut. (Fig. 289.) Here it is tied, the knot slipping through the little opening and applying itself to the mucous surface immediately beneath. (Fig. 290.)

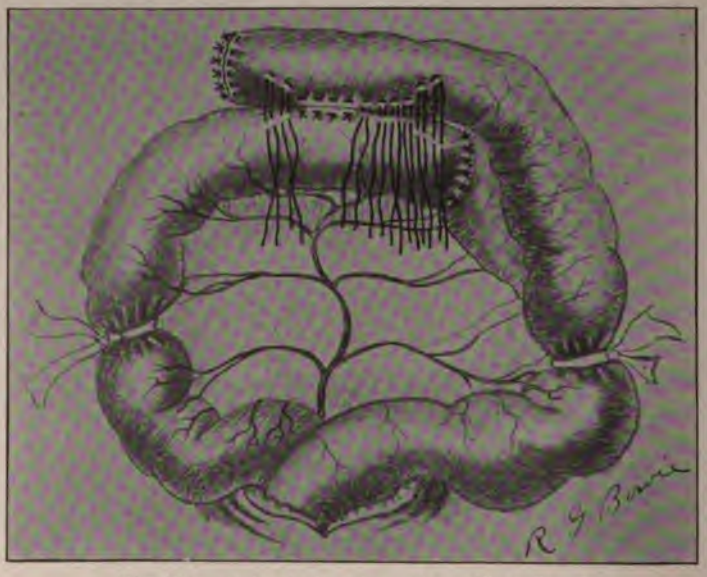


Fig. 291.—Lateral Anastomosis. (First Step.)

The suture is now cut short, and the bowel resumes its normal configuration. This completes the operation.

Lateral Anastomosis.—Where there is a marked difference in the caliber of the two sections of bowel to be united, or where for any reason end-to-end anastomosis is especially difficult, lateral anastomosis may be resorted to. In this the cut ends of the bowel are inverted and closed by suture, the inversion being necessary to bring the serous surfaces into contact. The two sections of the bowel are then brought side by side, the closed ends looking in opposite directions, and stitched together longitudinally for a distance of four inches. (Figs.

291 and 292.) Either the continuous overhand or the mattress suture may be used for this purpose, but care should be taken that the sutures be passed deep enough to include all the coats of the intestine except the mucosa, and special care taken that the lumen of the bowel is not entered. Should the suture enter the lumen of the bowel, capillary drainage from the bowel into the peritoneal cavity is likely to ensue, with disastrous consequence. On the contrary, a too superficial stitch is apt to yield and leave an open way for intestinal leakage. As the

Fig. 292.—Lateral Anastomosis. (Second Step.)

submucous fibrous lamina is the firmest tissue in the bowel-wall, it is desirable to include this in the loop of the suture. Kelly asserts that this may be recognized by the resistance which it offers to the needle, and that the needle may be so directed as to include some of the fibers of this tissue without passing through it. This line of suture being completed, an incision is made into the gut on either side just above and parallel to it, extending to within half an inch of the end of the suture line at either extremity. A continuous overhand suture now unites the edges of the two opposite coils of bowel so as to leave an open passage between them. (Fig. 293.) This leaves

a longitudinal depression over which the serous coat is closed by a line of sutures similar to the first. (Fig. 294.)

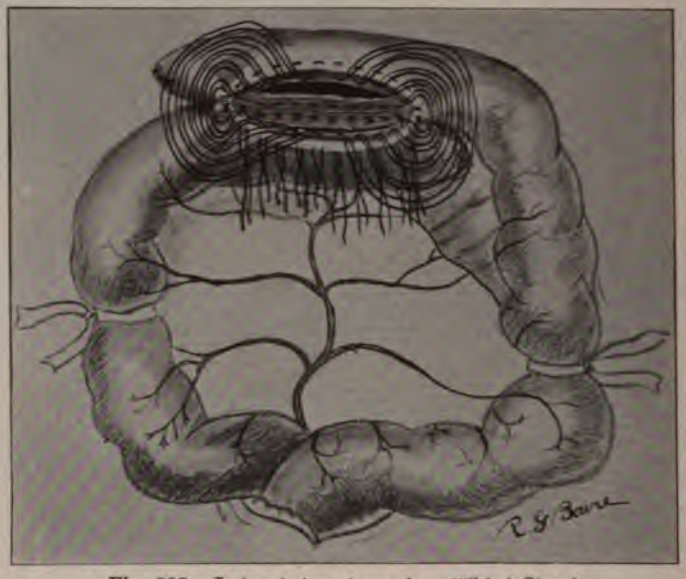


Fig. 293.—Lateral Anastomosis. (Third Step.)

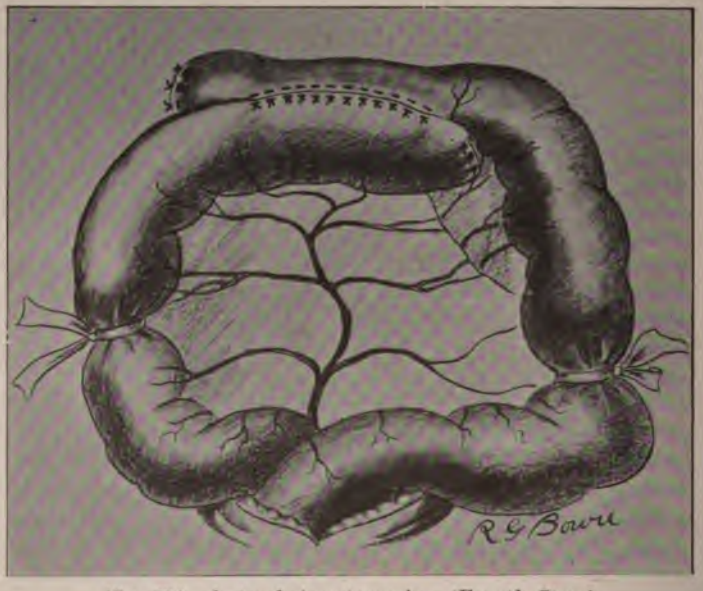


Fig. 294.—Lateral Anastomosis. (Fourth Step.)

Many of the accidents of ovariotomy are the result of carelessness or want of skill on the part of the operator. A reckless abdominal incision may result in serious damage to the bowel or bladder if either have intervened between the cyst-wall and the peritoneum. Forcible rending of adhesions may do irreparable damage to the viscera implicated, and the careless tying of vessels may result in the slipping of ligatures. Many fatal cases of post-operative hemorrhage are traceable to this cause. Sponges and instruments have been left in the abdominal cavity with fatal result. Fistula may follow the use of infected ligatures. It is also a common sequence of incomplete work, as where infected tissue is left in the abdomen. Obstruction of the bowels results from twisting, or adhesions and ventral hernia from imperfect coaptation of the incision.

Incomplete Operations.—In some cases the cyst is so extensively and firmly adherent to the intestines or other important viscera as to render its removal impracticable without immediate and great jeopardy to life. In such cases the cyst may be opened, its contents evacuated, and after cutting away redundant portions the open end of the cyst may be stitched to the abdominal wall. In case of simple cyst temporary packing with iodoform gauze will sometimes lead to adhesion and obliteration of the cavity. As a rule, the cyst refills.

CHAPTER XL.

SOLID TUMORS OF THE OVARY—CYSTS OF THE PAROVARIUM.

SOLID TUMORS OF THE OVARY.

THE solid tumors of the ovary are fibromata, myomata, papillomata, carcinomata, and sarcomata. Of these, the first two are benign and the last two malignant. Papillomata partake of the characters of both, and can be assigned to neither. Solid tumors of the ovary as compared with the cystic are rare, constituting only about 5 per cent. of the tumor formations of the organ.

Fibromata.—These are among the rarest of the growths of the ovary, constituting about 2 to 3 per cent. of them. They are apparently much more frequent, but many cases are taken for ovarian fibroma which upon critical examination would prove to be sarcomatous. They are usually smooth, pedunculated, and unilateral, though they are sometimes nodular, sometimes bilateral, and occasionally intraligamentous. They seldom attain a large size, but have been known to attain a weight of forty pounds. They consist, for the most part, of fibrous tissue, though smooth muscle-fiber is almost constantly present in greater or less quantity, and may constitute a very considerable proportion of the growth. Their consistence and color will depend on the relative proportion of these elements, the tumor being firm and white in proportion to the amount of fibrous tissue, and soft and red in proportion to the amount of muscle-tissue which it contains. They are subject to the same degenerative changes as the uterine fibroid. Of these, fatty, myxomatous, and calcareous are chief. They may become cystic from dilatation of the lymph or blood channels or from myxomatous degeneration. They are sometimes associated with sarcoma or carcinoma.

Myomata.—A pure myoma of the ovary—one consisting of pure muscle-fiber—is exceeding rare. They are more soft and succulent than the fibromata, and are distinctly muscular in aspect. They may attain a very considerable size. The mixed tumor consisting of muscle and fibrous tissue is far more common than either separately, the tumor generally receiving its name according to the preponderance

of tissue in its formation. Such tumors are more properly designated as myofibromata.

Papillomata.—The papillomata are papillary growths from the surface of the ovary. The true non-cystic papilloma of the ovary is so rare as to be in the nature of a curiosity. Many supposed cases will, on inspection, be found to be inverted papillomatous cysts. The behavior of these growths is identical with that of the cystic papilloma after perforation. Infection of the peritoneum and adjacent organs is the rule.

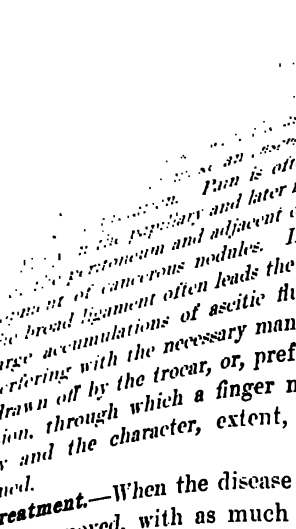
Treatment.—Solid, benign growths of the ovary should be removed on sight, as it is not possible before exploratory section to determine their true character. Furthermore, they are prone to degenerative changes which may make them dangerous to life. The technique is similar to that of ovariotomy, less the tapping, the pedunculated tumors being tied off at the pedicle and the buried growths enucleated. Papillomatous ovaries are so nearly malignant in behavior as to call for the most expeditious and thorough extirpation.

Carcinomata of the Ovary.—A large percentage of cancers of the ovary are secondary to cancers of the womb or other organs. Many cases arise from cancerous degeneration of the ovarian cyst. Primary cancer of the ovary is rare, and presents: (1) as an affection of the parenchyma; (2) as an epithelioma springing from the surface of the ovary.

THE PARENCHYMATOUS variety takes its origin in the glandular structure of the ovary, and occurs, for the most part, in the form of a diffuse infiltration of the stroma, whereby the organ becomes uniformly enlarged without conspicuous change of form. In rare instances a number of cancerous foci will develop in different parts of the organ, giving rise to a more or less nodular, or irregular-shaped, tumor.

THE EPITHELIOMATOUS variety springs from the surface of the ovary as a cauliflower or papillary excrescence. The growth is usually rapid, and, being vascular and unconfined, soon spreads to the peritoneum and contiguous organs. Abdominal dropsy is an early and constant accompaniment. Primary ovarian cancer usually affects both ovaries. It may appear at any period of life from early childhood to extreme old age. The growth may attain the size of the adult head.

SYMPTOMS AND COURSE.—Ascites is one of the first symptoms to attract attention. This is especially true of the cauliflower variety, where it declares early and becomes pronounced. Edema of the feet and ankles from pressure on the large vessels is also an early and sug-



strength, the lower extremities that scarcely admit of or of moderate intensity. infection occurs, followed by the development of cancerous nodules. Infiltration of the cellular tissue of the broad ligament often leads the growth to the depths of the pelvis. Large accumulations of ascitic fluid may obscure the diagnosis by interfering with the necessary manipulation. In such, the fluid may be drawn off by the trocar, or, preferably, through a small abdominal incision, through which a finger may be passed into the abdominal cavity and the character, extent, and location of the growth determined.

Treatment.—When the disease is confined to the ovary the organ should be removed, with as much of the broad ligament as is compatible with safety. It is also better to remove the opposite ovary even though it be apparently sound. Implication of the broad ligament to the slightest degree should be met by the removal of the uterus. In case the broad ligament is infiltrated to any considerable extent, or cancerous nodules are found on the adjacent viscera or in Douglas's pouch, operative interference will be fraught with special danger and will be unavailing.

Sarcomata of the Ovary.—Sarcoma of the ovary develops from the connective tissue stroma of the organ. It is usually of the spindle-cell variety. It occurs at all ages, ordinarily affects both ovaries, and occasionally attains enormous development. A sarcomatous ovarian tumor weighing eighty pounds has been reported. The growth is sometimes cavernous from dilatation of the vascular channels, and sometimes cystic from dropsy of the Graafian follicles. The shape of the ovary is not materially altered.

Symptoms and Course.—Pain is an uncertain symptom, and may be absent. Ascites exists, but is neither of such rapid formation nor so abundant as in cancer of the ovary. Infiltration of adjacent structures and metastasis are less apt to occur and are longer delayed than in cancer. Recurrence after removal is also less common and the loss of flesh and strength less rapid.

Diagnosis.—A solid, rapidly growing tumor of the ovary, attended by ascites and progressive loss of flesh and strength, especially if both ovaries be involved, would be highly suggestive of malignancy. As between sarcoma and cancer the differentiation will not easily be

made. This is not always possible, even after the removal of the growth, in the absence of microscopic examination. In a general way it may be said that the indications of a malignant growth of the ovary being present, taken in connection with a less conspicuous manifestation of ascites and edema of the lower extremities than usually occurs in cancer, would suggest sarcoma.

TREATMENT.—The only treatment is extirpation where this is feasible and where dissemination of the growth has not taken place.

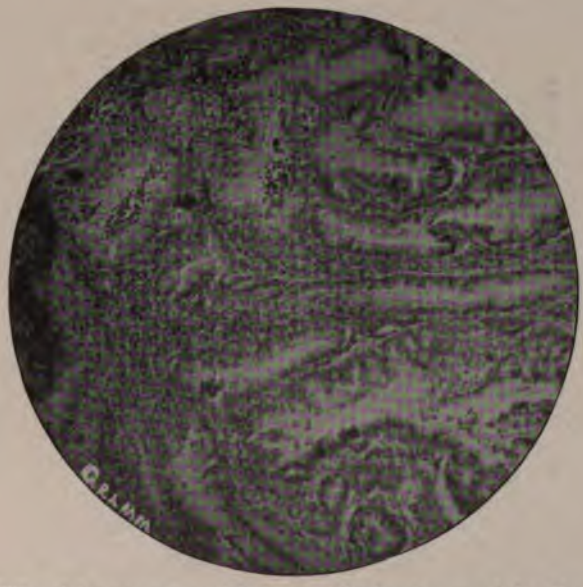


Fig. 295.—Adenosarcoma of Ovary. (Photomicrograph by Gramm.)

CYSTS OF THE PAROVARIUM.

The parovarium consists of a system of tubules situated in the mesosalpinx in the space between the ovary and Fallopian tube. The arrangement of the tubules resembles, in a general way, a toothed comb, the back of the comb being represented by the larger horizontal tubule and the teeth by the smaller tubules. The horizontal tubule lies just beneath and parallels the Fallopian tube, and is, in reality, the distal portion of Gärtner's duct. This duct, a relic of prenatal life, sometimes persists, and may be traced through the walls of the uterus and vagina to the urethra. It sometimes gives rise to vaginal cysts.

The smaller tubules communicate with the horizontal tubule by their upper extremities, while their lower extremities are closed. These are divided into two sets. One set, the vertical tubules, drop almost perpendicularly to the vicinity of the ovary. The other set, Kobelt's tubules, are less regularly disposed, and occupy the space somewhat external to the ovary. The vertical tubules vary in number from five to fifteen or twenty, and are lined with ciliated columnar epithelium. At times this epithelium is broken down and occupies the lumen of the tubule. Kobelt's tubules are lined with cubical epithelium. The tubules of the parovarium can usually be seen in the fresh specimen by holding it up between the eye and the light.

Fig. 206.—Cyst of the Parovarium. (Author's Case. Drawn from Specimen.)

Kobelt's tubules never take part in the pathologic processes of the parovarium because of the character of their epithelium. They are occasionally the seat of very small retention cysts about the size of a pea; but these are of no consequence, and are incapable of further development.

Cysts of the parovarium arise either from the vertical tubules or the horizontal tubule. The tubules being situated between the folds of the mesosalpinx, which is a part of the broad ligament, the development of the cyst is intraligamentous. In other words, it is an imbedded cyst, and has no pedicle. As the cyst enlarges it separates the folds of the ligament and pushes up under the Fallopian tube, which

becomes stretched over it and sometimes greatly elongated. Tubes of from one to two feet in length have been found stretched over the surface of the parovarian cyst. The fimbria are also elongated sometimes to the extent of four or five inches. The ovary is closely applied to the surface of the cyst, and may be flattened or spread out over it so as to be scarcely recognizable, but, as a rule, it retains its normal shape. Occasionally the parovarian cyst will force the wall of the broad ligament before it in such a way as to become pendulous in the peritoneal cavity, thus becoming intraperitoneal and pedunculated. Cysts of the parovarium are of two kinds: simple and papillomatous.

The **simple parovarian cyst** is round, regular in outline, with a bright, lustrous surface which often bears a delicate tint of amber or green. The cyst-wall is thin, transparent or translucent, and of equal thickness throughout. It is quite liberally supplied with vessels of small size, which form a beautiful arborescent limning (or tracery) on the surface of the cyst. The cyst-wall is made up of three layers, the external of which consists of peritoneum and represents the distended folds of the mesosalpinx. This layer is loosely attached to the middle layer, and can be easily stripped off. The middle layer is fibrous, with a variable amount of unstriped muscle-fiber; and the internal layer consists of columnar epithelium, which may become flattened or even absent from pressure in the larger cysts. These two layers represent the walls of the tubules from which the cyst took its origin. The contents of the cyst are clear, limpid, and opalescent. The specific gravity is low, ranging from 1.005 to 1.008.

The **papillomatous parovarian cyst** is characterized by the formation of warty excrescences or papillary growths on the interior cyst-wall. These are similar in all respects to the papillary cysts of the ovary, and are equally to be feared on account of their tendency to perforate the cyst-walls and infect the peritoneum. The walls are somewhat thicker than those of the simple cyst, and the contents usually less clear and of higher specific gravity. Some authorities claim that the dermoid cyst may take its origin in the parovarium; but, if the ovular theory of their origin be accepted, dermoid cysts of the ovarian type could not possibly originate in this locality. Parovarian cysts occur much more frequently than was formerly supposed, owing to the fact that many times they have been mistaken for ovarian cysts. They are of limited growth, and do not often attain a size larger than a child's head, though exceptionally they may grow to a considerable size. They are unilocular, and, in fact, furnish the purest type of unilocular growth, in that they are monocystic from first to

last and are free from the smaller cyst formations in their walls which characterize many of the so-called unilocular cysts. Very exceptionally, a parovarian cyst will be found containing several loculi, due, in all probability, to the blending of two or more tubules which have taken on cystic development.

Parovarian cysts may be unilateral, bilateral, or multiple on one or both sides. They sometimes extend from one broad ligament to the other under the peritoneum. They are of slow growth, and refill slowly after tapping or rupture. Contrary to the rule, the parovarian cyst will sometimes develop with marvelous rapidity. Tait speaks of having removed a very large parovarian cyst which had developed within six weeks. Owing to the thinness of the walls, these cysts are quite subject to accidental rupture. Many cases give a history of alternate filling and collapse of the sac from this cause. In the simple cyst the fluid is bland and unirritating, and is readily disposed of by the peritoneum, being absorbed and expelled in the urine. Cysts of the parovarium develop during the active period of sexual life. They do not occur in children, and are seldom found in the aged. The parovarian cyst may be distinguished from the ovarian by the presence of the ovary, which is attached or lies in proximity to the cyst-wall; by the Fallopian tube stretched over its surface; and by the low specific gravity of the cyst contents.

Symptoms.—The parovarian cyst often develops and exists indefinitely without symptoms. When it burrows into the depths of the broad ligament and crouches on the pelvic floor, or pushes outward under the peritoneum anteriorly or posteriorly, or crowds upon the bladder or rectum, there may be symptoms referable to these viscera, or there may be pressure symptoms, due to the encroachment on other viscera, or rending pains from the forcible separation of the peritoneum by the burrowing cyst.

The **diagnosis** cannot often be made with certainty. A simple, somewhat flaccid cyst, with very distinct fluctuation, which to palpation presents no nodular masses and gives a history of slow growth and absence of symptoms, would strongly indicate a cyst of the parovarium.

Treatment.—Cases are on record in which after rupture or tapping the cyst failed to refill. Tapping, however, is unsurgical, and should not be resorted to, because of the possibility of infection or of liberating the contents of an infectious cyst. The ideal treatment is by incising the peritoneum at a convenient point, usually as near the base of the cyst as possible, and stripping it off, or what amounts to the same thing,—enucleating the cyst. (Fig. 296.) Where, for any

reason, this is impracticable or inadvisable, the cyst may be opened and emptied, and the cyst-wall stitched to the abdominal wall so as to secure permanent drainage. Cures have been effected by cutting away a portion of the cyst-wall without any provision for external drainage. This method should only be practiced in the simple, uninfected cyst, and usually then where there is obvious reason for not doing the radical operation of enucleation.

CHAPTER XLI.

DISEASES OF THE URETHRA AND BLADDER.

METHODS OF EXAMINATION.

EXAMINATIONS are made by inspection, palpation, and the use of instruments. **Inspection** unaided by instruments is of limited scope and value, and is confined to the meatus urinarius and possibly the openings of Skene's ducts, which lie just within the meatus.

Fig. 297.—Kelly's Calibrator.

The urethra may be **palpated** full length by placing a finger in the vagina and tracing its course along the anterior vaginal wall. That portion of the bladder which is in relation to the vagina may also be palpated through the vagina, but more perfectly so by the

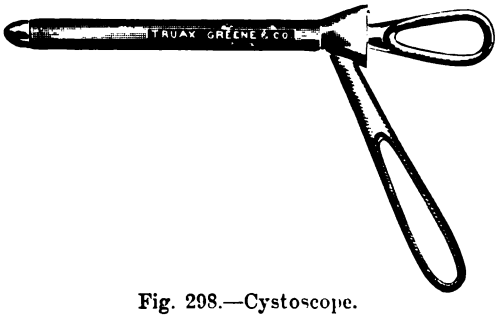


Fig. 298.—Cystoscope.

bimanual examination with the hand on the lower abdomen. The ureter may be palpated by fingers in the vagina as it skirts along the pelvic brim, and with a finger in the rectum may often be followed to its emergence from the pelvis near the sacral promontory. In the first part of its course it is recognized as a cord skirting the pelvic

wall and occupying the border-line between the lax tissues surrounding the cervix and the firmer tissues in relation to the pelvic wall.

Instrumental Examination of the urinary tract is much more satisfactory, and takes a much wider range than that just described. The instruments most in use in this country are those devised or introduced by Kelly, and consist of: (1) a conical calibrator; (2) a set of cystoscopes; (3) a suction apparatus; (4) a long, slender, mouse-tooth forceps; (5) a searcher; (6) an applicator; (7) ureteral catheters; and (8) a reflecting mirror. The conical calibrator is metallic, and scaled to indicate its diameter at different portions of its length. The diameter ranges from four to twenty millimeters. This is used to ascertain the size of the urethral orifice and also for the purpose of dilating the same. Dilatation should never exceed the maximum of twenty and not often over sixteen millimeters, lest permanent incontinence of urine result. The cystoscopes are straight, metallic tubes of graduated sizes, each of which is provided with a handle and obturator. They range from four to twenty millimeters in diameter, and are intended to follow the calibrator. The sizes most frequently used are from eight to twelve millimeters in diameter. The cystoscope is, in fact, a urethral speculum, and will frequently be referred to as such.

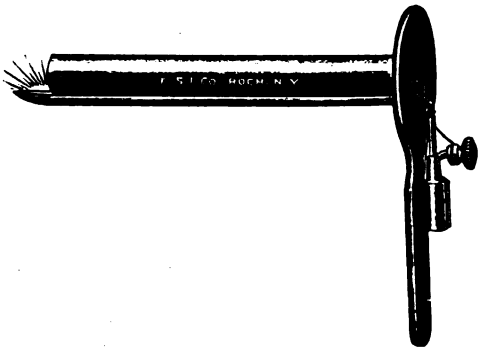


Fig. 209.—Electric Cystoscope.

Examination.—Sensitive patients will require an anesthetic; others may be examined after cocaine anesthesia, by applying a pledget of cotton saturated with a 10-per-cent. solution of cocaine to the meatus for a period of from four to six minutes. Some introduce a cotton wrapped sound into the urethra saturated with a solution of cocaine of the same strength, which is allowed to remain the same length of time. This latter is not always safe, as death has resulted from cocainization of the urethra. It is furthermore seldom necessary, as the meatus is the *locus* of sensation and resistance to the dilator, or speculum.

The patient should be prepared by having the genitals well

cleansed, the bladder and bowels emptied, and the clothing removed or completely loosened. The examination may be made in the knee-chest or the exaggerated lithotomy position, the pelvis being elevated on firm pillows a foot or more above the level of the table. The latter position is sometimes applicable to thin women of lax fiber, but never to women with thick and firm abdominal walls. (Fig. 301.) It is never so satisfactory as the knee-chest position, but has the advantage of being eligible with the use of an anesthetic without special contrivance.

The patient being in position, the labia are separated, the vestibule wiped with an antiseptic solution, and the calibrator introduced to determine the size of the meatus and if necessary to dilate it by a rotary motion. The calibrator is withdrawn and a cystoscope somewhat less in size than the urethral measurement introduced into the bladder. Any kind of artificial light may be used, but should be backed by a condenser to concentrate the rays of light on the head-mirror.

Fig. 300.—Head-mirror.

This condenser should be in the form of a concave disk with a white painted surface to obviate the dazzling effect of a bright reflector. The electric light is preferable, and a more satisfactory view can be obtained in a darkened room where the diffuse sunlight is excluded. The light should be thrown upon the head-mirror, which is adjusted and used as for eye and throat work. By directing the reflected light through the speculum into the bladder its walls are illuminated over a definite radius. The speculum is now withdrawn until the folds of the urethra begin to close over it, when it is advanced just far enough to clear them. Now by moving the handle of the speculum first in one direction and then in another the entire

interior of the bladder may be brought into view and examined critically. Usually there is a little pool of urine in the most dependent portion of the bladder, which obscures the field and must be sponged away by little wads of cotton held in the bite of the mouse-tooth

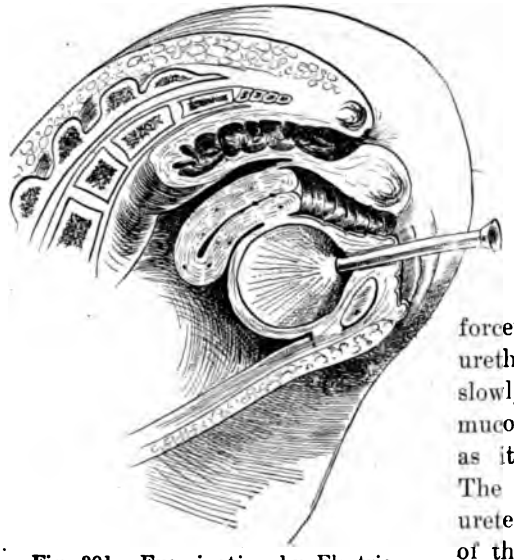


Fig. 301.—Examination by Electric Cystoscope.

forceps. To examine the urethra the cystoscope is slowly withdrawn and the mucous membrane inspected as it closes in behind it. The examination of the ureters and upper portions of the urinary tract will be considered later on.

THE URETHRA AND ITS DISEASES.

The urethra is a muscular tube lined with mucous membrane and covered on the vaginal side with the vaginal mucosa. It is one and three-fourths inches in length, one-fourth of an inch in diameter, and terminates at either extremity in a slit-like orifice. The slit of the external meatus corresponds in direction to that of the vulvar cleft, being antero-posterior, while that of the internal meatus is transverse. The mucous membrane of the urethra is loose and disposed in longitudinal folds, so that on cross-section it presents a stellate appearance. When empty, the walls of the canal are in contact. The urethra, with the exception of its orifices, is pliant and yielding and capable of great distension. The meatus externus and to a lesser degree the meatus internus are dense and offer considerable resistance to dilatation. The meatus externus is very sensitive, and gives rise to exquisite suffering when rudely distended. Anything that will pass the external meatus will pass unobstructed up the urethral canal. Skene's glands are two

small tubular follicles that extend upward along the floor of the urethra from just inside the meatus. They are about one-half to three-fourths of an inch in length and of a caliber sufficient to admit a fine probe. Their orifices may be seen by placing a finger on either side of the meatus and separating the walls. In ectopia of the mucosa from inflammation or other cause the orifices appear external to the meatus. They are important as being the lurking places of pathogenic germs, especially the gonorrheal, which they foster and keep alive for long periods. When infected, a drop of pus will often be found at the orifice or may be made to appear by milking the gland with the finger. In chronic gonorrhea they should always be examined.

ABSENCE OF THE URETHRA.

The urethra may be absent in whole or in part. Its complete absence is exceedingly rare, and is usually one phase of a more extensive developmental defect of the genito-urinary tract. In such cases the bladder opens directly into the vagina. Frequently the opening is a mere slit. Incontinence of urine is usually present, though the slit-like opening may be sufficiently closed as to give the patient partial control. Other evidences of defective development are found in a partial absence of the urethra, which may affect one or the other extremity or the intermediate portion. When the proximal extremity is absent, incontinence or partial incontinence of urine will co-exist, as in the case of complete absence of the urethra, and dependent on the same conditions. When the distal extremity of the urethra is absent, the patient will have normal control of the urine, but it will escape into the vagina. Defective development of the intermediate portion of the urethra usually manifests as an opening in the urethral floor. This may be small or extensive. Occasionally it is absent throughout the greater part of its length, the urethral canal being represented by a groove. Occasionally the external orifice of the urethra is displaced to the under surface of the canal. It may open into the vagina at any portion of its length and the opening may be large or small. This constitutes what is known as *hypospadias*.

Treatment.—A urethral canal may sometimes be formed by dissecting up flaps from either side of its course,—the dissection being carried from without toward the urethra,—the raw edges of which are united by fine suture over the intended canal. The suturing should be over a catheter, which should be allowed to remain from three to six days.

URETHRAL CARUNCLE.

The urethral caruncle is a benign neoplasm, of a pale or reddish hue, and situated at or just within the external meatus. It is made up of enlarged capillaries, connective tissue, and covered with mucous membrane. Although usually single, there may be two or more surrounding the orifice. These growths are very vascular, bleed readily, and are extremely sensitive. They may be sessile or pedunculated, and vary in size from a grain of wheat to a plum.

Symptoms.—The most conspicuous symptom is pain. During urination or sexual intercourse the pain becomes excruciating. Nervous symptoms, due to pain and loss of sleep, are often pronounced, and anemia results from loss of blood.

Treatment.—Ablation of the growth with knife or scissors. The edges of the mucous membrane should be brought together by sutures.

PROLAPSE OF THE URETHRAL MUCOSA.

This is most common in children and weakly women. It is caused by straining efforts or the vesical tenesmus associated with cystitis or stone in the bladder, or the mucosa may be dragged down by a urethral growth.

Symptoms and Diagnosis.—The symptoms are painful urination, often associated with vesical tenesmus. There is sometimes incontinence of urine. If inflamed, the prolapsed mucosa may become very tender, and interfere with walking or coition. The prolapsed portion is highly vascular and intensely red. It forms an unbroken circular protrusion, in the midst of which may be found the urethral canal. About the only condition with which it is likely to be confounded is that of irritable urethral caruncle. In the latter the protruding mass is more circumscribed and tumorous; occupies only a portion of the meatus, usually the posterior segment; and is exquisitely sensitive, friable, and prone to bleed.

Treatment.—As a preliminary to treatment the cause should be sought for and removed. Straining at stool should be obviated by strict attention to the bowels, piles and fissures of the anus appropriately treated, and vesical calculi and urethral growths removed. In recent cases, where the exciting cause has ceased to exist, reduction of the prolapsed mucosa, with rest in bed, assisted, if need be, by astringent urethral suppositories or injections, will sometimes effect a cure. In old or intractable cases the redundant mucosa should be

excised and the proximal and distal ends united by fine suture. It is better to introduce the sutures before excision to prevent retraction of the upper portion of the mucosa.

ATRESIA OF THE URETHRA.

Atresia of the urethra may involve the entire length of the canal or be limited to a portion of it. It may be confined to the meatus internus, and consist of a thin, membranous septum between the urethra and bladder. The urine may find exit at the umbilicus through an open urachus, failing which it distends the bladder, ureters, and kidneys, sometimes resulting in marked abdominal enlargement. As the condition is usually prenatal, this abdominal distension occasionally gives rise to dystocia, and necessitates abdominal paracentesis of the fetus before it can be delivered.

Treatment.—Membranous atresia or one that does not exceed a few lines in length may usually be overcome by perforation and dilatation through the urethral canal. In atresia of the anterior portion of the urethra an opening should be made back of the obstruction and the urethral mucous membrane stitched to that of the vagina to prevent closure. Complete atresia of the urethra leaves but one resource: that of producing a permanent fistula in the bladder by uniting its mucosa to that of the vagina after making a liberal-sized opening. Many of this class of patients are so radically defective in development as to require no surgical intervention, such measures being anticipated by the death of the little sufferer.

OVERDISTENSION OF THE URETHRAL CANAL.

This may result from rude and excessive dilatation, from the delivery of a large vesical calculus through the urethra, from the expulsion of calculi or morbid growths from the bladder, from the introduction of candles or other bulky bodies into the urethra for the purpose of masturbation, or from coition through the urethral canal. This latter is usually resorted to only in case of vaginal atresia.

Symptoms.—Very extensive dilatation of the urethra, if produced gradually and without violence to the circular muscle-fibers of the canal, is often unaccompanied by any serious results. The urethral canal itself may remain patulous, but the vesical sphincter be unaffected or weakened to a degree. This is especially manifest in cases resulting from urethral copulation or masturbation. Here is often found the most extreme urethral dilatation without evident incon-

venience to the patient, unless it be immediately after intercourse. In cases resulting from other causes, in which the distension has been rude and precipitate, incontinence of urine, with all its attendant evils, is usually present.

Diagnosis.—When incontinence exists, parting of the labia will disclose the patulous urethral orifice, into which a finger may be thrust or from which the urine may be seen escaping. In cases resulting from sexual congress the canal is so conspicuously enlarged as to attract attention, whatever means of examination be employed.

Treatment.—In cases resulting from rapid divulsion and attended with incontinence of urine the treatment is too often unsatisfactory. Cases have been benefited by a specially devised pessary, which was so formed and adjusted as to make pressure over the urethra and keep the walls in contact. For the radical cure of the difficulty a number of surgical expedients have been resorted to with varying success. The urethra has been drawn forward and spread out over the vestibule in such a way as to bring the anterior and posterior walls in close contact, and after denudation sutured there. It has been loosened from its attachments and resutured after being twisted upon itself. The floor of the urethra has been removed and the edges brought together by suture, or the vaginal mucosa over and to either side of it denuded and sutured so as to reduce its caliber. In all such operations a small catheter should occupy the canal before the sutures are tied to gauge its caliber.

INCONTINENCE OF URINE RESULTING FROM ORIFICIAL EXCITATION.

This is a condition which has hitherto received little attention, but which is nevertheless a prominent factor in many cases of incontinence where the cause is not obvious. Orificial irritation as a cause of reflex phenomena is well attested. The effects of orificial excitation in producing expulsive action of the organ to which the orifice is the outlet is almost too well known to call for comment. Tickling of the fauces will produce vomiting, titillation of the nostrils will produce sneezing, and irritation of the rectum will produce action of the bowels. The mother often regulates the bowels of her infant by pushing up through the anus a conical piece of hard soap or a whittled down potato. The eyes, the nose, and, in fact, every secretory organ of the body and every excretory reservoir may be made to expel its contents by orificial excitation. The urethral orifice and its environments are especially impressionable by reason of exalted nervous en-

dowment. That sexual excitement has the effect of evoking detrusive efforts of the bladder is evidenced most strikingly in some of the lower animals, in whom, when under the dominance of the sexual passion, frequent urination is a constant phenomenon. It does not follow that in the human female salacity or even a conscious degree of sexual excitement is necessary to the result, but I believe that an erethism exists, nevertheless, and that it is an etiologic factor in many cases of urinary incontinence. The tissues in the vicinity of the urinary meatus are erectile and are subject to turgescence; they are excitable, and are subject to twitchings and contractions, and in some women they are the seat of a more or less exalted voluptuous sense, any one or all of which may awaken reflexes which may end in the expulsive efforts of the bladder.

Of course, much will depend upon the esthetic condition of the patient or parts. It must be remembered, furthermore, that the class of patients with which we are concerned are, as a rule, neurotic, and hence greatly more susceptible than women who are gifted with a nervous equipoise.

While inordinate excitability of the peripheral or orificial nerves may lead to reflexes, arrest or inhibition of the active reflexes may be effected by obtunding the nervous sensibility or more effectually by resection of the nerves concerned. Sneezing may be prevented by firm pressure on the upper lip immediately beneath the nose, defecation may be averted or retarded by firm pressure over the anus, and it is a matter of common observation that children often restrain an impending urination by crossing their legs and pressing the thighs firmly against the lower genitals. With these facts in mind, the rational treatment for reflex incontinence will be obvious: it is to remove the exciting cause, or, if that cannot be done, to cut off the nerve-supply through which the reflexes are engendered.

Illustrative Cases.—Some years since a young lady presented herself to me with incontinence of urine which had existed from childhood and which had resisted all treatment. On careful inspection of the genitals I found two membranous wings—one on either side—which extended from the urethra out along the vulvo-vaginal junction. These represented the anterior segment of the hymen. They were removed by the scissors and the raw surfaces sutured, with the result of an instantaneous and perfect cure. My colleague, Professor Hoover, removed a tongue-like process of fibrous consistence from the anterior segment of the meatus and cured an incontinence that had existed from birth.

That these bands of which I speak are capable of evoking and perpetuating a vast amount of local irritation is further evidenced

by the vulvar hyperesthesia and vaginismus so frequently witnessed as the result and so effectually relieved by the ablation of the remains of the hymen.

Treatment.—I am not prepared to say that a band, however attenuated, exists in all cases, but I do believe that a hyperesthesia exists

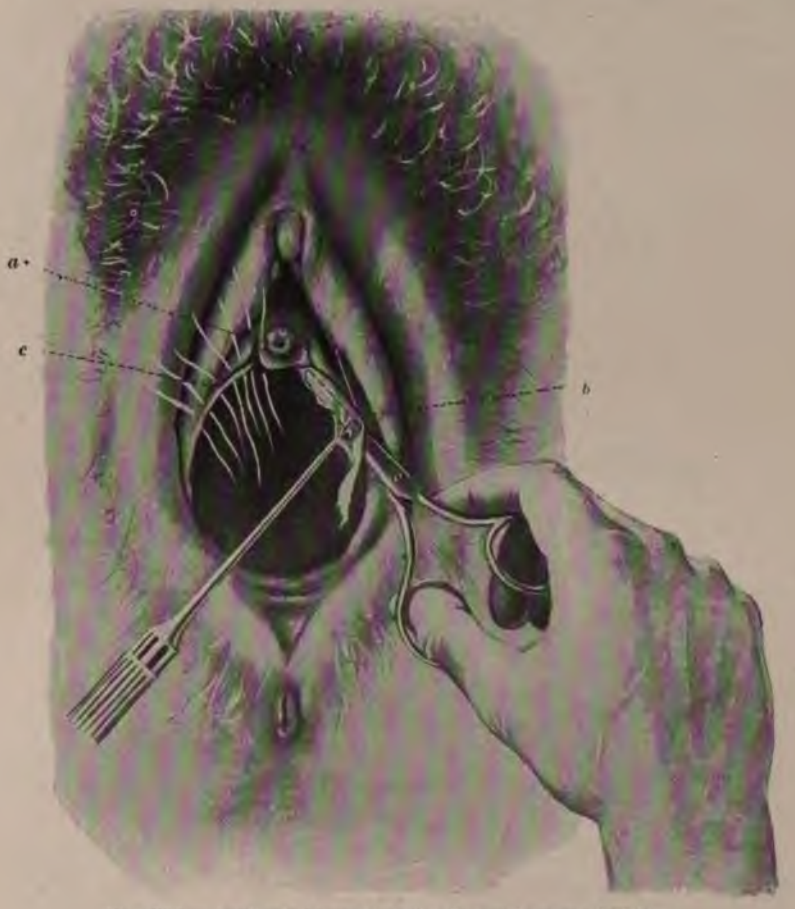


Fig. 302.—Author's Operation for Incontinence of Urine.
(American Journal of Obstetrics.)

a, Meatus. *b*, Excision of the membrane. *c*, Sutures introduced after excision of membrane and incision alongside of urethra.

in all, and the indications are to isolate the terminal extremity of the urethra by severing the nerves and tissues. In order that the nervous communication may not be restored, the raw surfaces should be closed

in by suture, so as to separate the fibers so far as possible. (Figs. 302 and 303.) If no band exists, the dissection along the vulvo-vaginal junction will not be required, and then it will only be necessary to make an incision along either side of the meatus and bring the tissues together at right angles to the line of incision. The incisions should be about one-third of an inch from the sides of the urethra and from one-fourth to one-third of an inch in depth. For the sutures a fine silk thread should be used, and the sutures nicely adjusted, both for the purpose of facilitating healing and to prevent hemorrhage, to which there is a strong tendency. A bland protective—such as cold cream, dolomol, zinc powder, or, better still, white lead paint—will

Fig. 303.—Author's Operation for Incontinence of Urine. (American Journal of Obstetrics.)

Manner in which the incision is carried up alongside the urethra and the effect after the sutures are tied.

contribute to the comfort of the patient by preventing the contact of urine.

After the operation the patient will often go many hours without voiding the urine, but catheterization is neither necessary nor expedient, for the bladder will empty itself in due time, usually once or twice in twenty-four hours. The stitches should be removed in ten days, or sooner if they show disposition to cut out. A rest in bed for two or three weeks will be advisable to secure firm union. The effects of this operation are threefold: the peripheral nervous influence is cut out and muscular action eliminated, while the banked tissues exert compression of the urethral orifice.

CHAPTER XLII.

DISEASES OF THE URETHRA AND BLADDER (Continued).

STRICTURE.

STRICTURE of the female urethra to such a degree as to give rise to symptoms is exceedingly rare. It is caused by injuries incident to childbirth and other forms of trauma, gonorrheal urethritis, syphilis, caustic applications, and in very rare instances by tuberculosis. Its most usual site is the meatus, though it may occur in any portion of the canal.

Symptoms.—The symptoms are not always defined, but when present consist of frequent and difficult urination. Occasionally there is incontinence, which may be alternated with retention, or periods

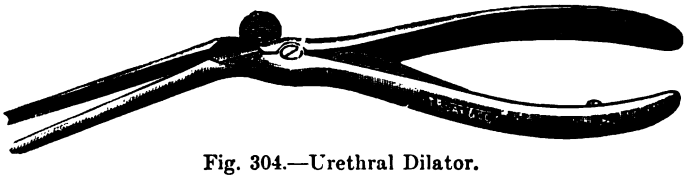


Fig. 304.—Urethral Dilator.

of temporary retention may occur independently. The symptoms are more pronounced the nearer the stricture is to the bladder.

Diagnosis.—By palpation along the course of the urethra the location of the stricture may be determined by thickening and induration of the walls. Introduction of the sound or catheter will disclose the site of stricture. To determine more accurately its location, extent, and degree the olive-pointed bougie may be brought into requisition.

Treatment.—The stricture may be gradually dilated by means of Hegar's or other form of dilator, care being taken not to use too much force, proceed too rapidly, or carry the dilatation too far, lest rupture of the urethra and permanent incontinence ensue. In case of unyielding stricture the urethrotome may be used, followed by dilatation. One-half of an inch of dilatation is the maximum that can be attained with safety. The dilators may have to be used at stated intervals for

an indefinite time to prevent recontraction. After the initial dilatation to the extent desired the dilators may be intrusted to the patient, who soon learns how to use them.

URETHROCELE.

This is a sacculated condition of the middle portion of the urethra. The sac forms a soft, tumorous mass at the vulva or just within the vagina, and apparently springs from the meatus. It seldom attains a size larger than a walnut.

Causes.—The most common cause is inordinate pressure of the urine, made necessary by some obstacle to its passage along the canal. The obstruction may be in the form of a stricture or a neoplasm which blocks the channel. Urethrocele is sometimes caused by impact of the child's head in labor. The sac may consist of all the coats of the urethra or of a hernial protrusion of the mucosa through a rent in the muscularis.

Symptoms.—There is usually more or less reflex irritability of the bladder, with frequent urination and dysuria. Occasionally there is incontinence or there may be periods of retention. Neither of these is characteristic, but taken in connection with a palpable enlargement of the vaginal aspect of the urethra, the *ensemble* is suggestive.

Diagnosis.—As the urethrocele is usually filled with residual urine or pus, pressure on the sac will cause one or the other to escape from the meatus. A bent probe introduced into the urethra will enter the sac, and may be felt by a finger in the vagina. In this way the sac may be explored and its dimensions ascertained. Urethrocele may be simulated by thickening or prolapse of the vaginal mucosa, by urethral cyst, and by suburethral abscess. In the conditions named the probe is not deflected from the canal, and cannot be palpated with such distinctness by the vaginal finger, if at all. A suburethral abscess communicating with the urethra would simulate urethrocele very closely, but it is sore and tender, and may usually be traced upward toward the broad ligament, from whence it originates.

Treatment.—If the urethrocele depends upon some obstruction in the canal and the damage to the urethral floor be not too great, removal of the cause will sometimes result in cure. As a rule, it will be necessary to repair the urethra by excising the sac and bringing the edges together over a catheter introduced into the bladder. The catheter may be withdrawn in three days; the stitches may be allowed to remain six or eight days.

URETHRITIS.

Inflammation of the urethra is much less common in woman than in man. It is also less persistent and more amenable to treatment. Urethritis may be superficial or catarrhal, deep seated or interstitial, or it may chiefly affect the follicles (follicular urethritis).

Causes.—In most instances urethritis is the result of microbic infection. Catheterization and the introduction of foreign bodies into the urethra for purposes of masturbation not only carry the germs into the urethra, but inflict a trauma as well, upon which the germs fasten. Chemicals introduced into the urethra, acrid discharges from the bladder, highly concentrated urine, the passage of vesical calculi, and the exanthemata may each and severally act as causal agencies. The great cause of urethritis in the female is the specific germ of gonorrhea. So commonly is this the case that urethritis in the female is considered almost *prima facie* evidence of gonorrhea.

Symptoms.—The first indication is an itching or smarting, which is soon followed by a scalding sensation in urination. Urination is frequent, and attended by tenesmus. Occasionally a little blood is discharged along with the urine. This is not mixed with the urine, as in vesical or renal hemorrhage. The aggravated symptoms seldom continue long, and gradually subside, as the disease tends to resolution or merges into a state of chronicity. Frequent urination may continue after the other symptoms have vanished. Especially is this the case in the chronic form of the disease. The physical signs of urethritis are a patulous, pouting, urethral orifice, the protruding mucosa being deeply injected and darkly suffused. The orifices of Skene's glands become conspicuous, being pushed outward by the swollen mucosa and dilated by the inflammatory infiltration. This is more especially the case where they are implicated, as in gonorrheal urethritis. Pus may be found at the orifices or expressed from the depth of the gland. The urethra is enlarged, cord-like, and sensitive to the touch, as determined by a finger in the vagina. By drawing the finger forward along the course of the urethra pus may be milked from the orifice if it has not been washed away by a recent urination. The amount of pus is usually small, not exceeding a drop or two, and the meatus should be wiped dry and exposed to plain view in order to detect it as it appears at the orifice.

In chronic urethritis the expressed fluid is muco-purulent or gleety. By the use of the endoscope the exact condition of the urethral mucosa may be determined.

Diagnosis.—The painful, swollen, and tender condition of the urethra are unfailing indications of urethritis. The diagnosis may be strengthened by the other symptoms alluded to above.

Treatment.—The treatment is on the same lines as that of urethritis in the male. During the acute stage no local treatment should be attempted. The patient should have a rest, the bowels kept soluble, and the urine rendered bland and unirritating. For the bowels salines are preferable; for the urine diluent drinks, such as flaxseed-tea. Neutralizing and soothing remedies such as benzoate of soda or ammonia, boric acid, or aminiform (non-officinal) may be given *per os* every three or four hours in doses of 10 grains each. Hot sitz-baths and vaginal douches are soothing, but the latter should not be used unless the vagina be involved, lest the infection be carried upward along the genital tract.

After the more acute symptoms have abated and the disease seems disposed to hang on, resort may be had to the so-called anti-blennorrhagics, such as salol, copaiba, oil of sandal-wood, and cubebs. Small doses of santonin often act magically. It is not always necessary nor expedient to resort to local applications to the urethral mucosa, as their injudicious use may prove harmful. If, however, the disease does not yield to general treatment, local applications will be in order. One of the best of these, because least harmful and because of its wide range of application, is irrigation with hot water. For this a reflux catheter like that of Skene's should be used. It should be introduced up to, but not through, the internal meatus, and the reservoir should not be elevated more than twelve or eighteen inches above the level of the bladder. By this means a quart of hot water may be run through the urethra once or several times a day. Flushing the urethra is not only beneficial in itself, but increases the efficacy of topical applications following it.

If the disease prove rebellious to treatment, topical applications may be made to the urethral mucosa. A non-officinal silver preparation known as protargol has recently come into favor. It may be used in solution of a strength of from 1 to 5 per cent. One of the best of the officinal preparations for this purpose is the solution of nitrate of silver. This may be used of a strength of from 1 to 10 or 15 grains to the ounce, according to indications, the milder solutions being used first and the stronger later.

Mineral and vegetable astringents in great variety—such as zinc, lead, alum, tannin, and hydrastis—have been resorted to as topical applications for urethritis.

It is not so necessary to vary the medicament as the strength of the application. Topical applications to the urethra may be instilled by means of the pipette or carried up on a cotton wrapped probe. The pipette should be introduced the full length of the canal and the instillation made as it is slowly withdrawn. As the capacity of the urethra is about 15 minims, a larger quantity than this should never be instilled. Care should be exercised that the fluid is not carried nor forced into the bladder. Topical applications should always be made after irrigation or after the urethra has been washed out by urination. In old cases with thickened walls and tendency to stricture, the daily use of the urethral sound will be of great benefit. The sound should be of sufficient size gently to distend the canal, and may have to be changed to correspond to the increasing size of the canal.

Skene's glands frequently harbor the germs long after they have been dislodged from the urethra. This perpetuates the local trouble, and is liable to renewed infection of the urinary and genital passages. A persistent, purulent secretion is the indication of infection, and should be met by splitting up the ducts with a fine scissors and thoroughly cauterizing the exposed surface with carbolic acid or nitrate of silver.

VESICO-URETHRAL FISSURE.

This is situated at the urethro-vesical junction, and in general appearance and conduct resembles the anal fissure. In form it is elliptical; with tapering extremities. As a rule, it is from one-fourth to three-eighths of an inch in length and from one-twelfth to one-sixth of an inch in breadth at its widest part. The major portion of the fissure is situated in the urethral canal, the upper extremity extending into the bladder. The floor of the fissure is covered with a yellowish-gray scum, while its edges are red and angry. It is found most frequently on the right side, but may occupy any portion of the urethral circumference.

The **causes** of urethro-vesical fissure are not definitely known, but it is frequently associated with or follows a urethritis. It has been ascribed to injuries during confinement and to the unskillful use of the catheter.

Symptoms.—The symptoms are similar to those of a combined urethritis and cystitis, but usually more intense. There is a constant desire to urinate, and frequent urination. This latter is attended with severe tenesmus and burning pain. The burning and aching are not

relieved, but rather intensified, by urination, and continue for a considerable period. Pressure on the urethro-vesical junction elicits sharp pain.

Diagnosis.—A diagnosis of reasonable certainty can be made from the symptoms, but positive knowledge can only come from sight. The open-ended cystoscope is not adapted to this purpose, as the infolding of the mucosa over the end of the instrument conceals the fissure. Skene's endoscope, which is made of glass and resembles a test-tube and a small laryngoscopic mirror, is admirably adapted to exposing the fissure, as it opens up the folds of the mucosa. A head-mirror throws the light upon the small mirror within the tube, which, by

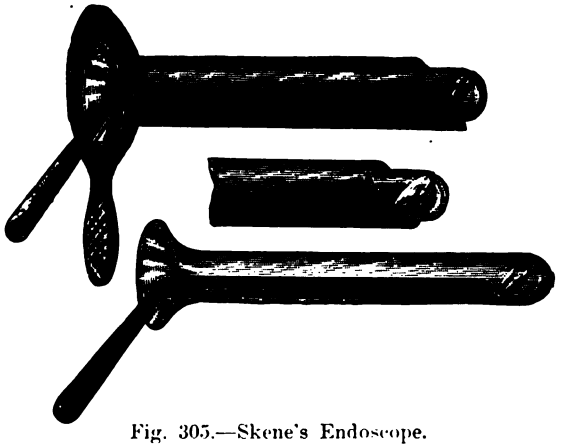


Fig. 305.—Skene's Endoscope.

being moved about, catches the image of the fissure and reflects it to the eye.

Treatment.—The treatment is similar to that of anal fissure: that is, to allay the continuous spasmodic action of the sphincter muscles by full dilatation or by dividing them. Dilatation should not be carried beyond one-half of an inch, lest permanent incontinence ensue. The patient should be put to bed and the urine rendered bland by the use of liquor potassa, benzoate of ammonia, or boric acid. Elevation of the hips, so as to prevent contact of the urine with the fissure until the bladder becomes full, will contribute to the healing of the fissure by lengthening the periods between the acts of urination, which means longer intervals of quiescence of the sphincteric muscles. As a last resort, the bladder may be drained through an artificially produced vesico-vaginal fistula, which will secure absolute rest for the

sphincter. The incision into the bladder should be ample, and no attempt made to render the fistula permanent, as by the time it has closed the fissure will have disappeared.

On rare occasions the urethra is the site of *cystic growths* and of *polypi*. These growths give rise to no symptoms unless they be large enough to obstruct the passage of urine. The cysts may be incised or a portion of the wall cut away and the polypoid growths removed either by scissors or torsion.

DISEASES OF THE BLADDER.

DIVISIONS OF THE BLADDER.

For purposes of description the bladder is divided into three parts: the body, base, and neck, or, technically speaking, into corpus, fundus, and cervix. The body of the bladder is that portion which lies above the level of the ureteral openings and the middle of the symphysis pubis. All that portion which lies below this plane is the base. The neck is the funnel-shaped portion which connects the urethra with the amplified portion of the bladder. The trigone is the triangular space at the base of the bladder between the two ureteral orifices and the internal orifice of the urethra. It is approximately an equilateral triangle, the sides of which are from an inch to an inch and a half in length. The ureteral orifices are therefore from one-half to three-fourths of an inch from the median line on either side. This fact should be borne in mind, both with reference to examination and in operations on the base of the bladder.

CONGENITAL MALFORMATIONS OF THE BLADDER.

The congenital malformations of the bladder are quite numerous, but happily not of common occurrence. They are usually associated with other developmental defects of the genito-urinary tract. The bladder is sometimes divided into compartments, ranging in number from two to five. Most frequently there is but one septum and two compartments. These may be disposed variously with relation to each other; but, as a rule, they lay side by side or one above the other. Two or more distinct bladders have also been reported. Care should be taken not to mistake a sacculated bladder for either of the conditions above named. On account of the close resemblance, the probabilities are that many of the supposed instances of divided or super-

numerary bladder have, in reality, been examples of the sacculated bladder, inasmuch as the latter condition is much more frequent than either of the others. The sacculated bladder is the result of disease, traction, or pressure, and is not often congenital. In very rare instances the bladder may discharge its contents above or through the symphysis pubis, in others through the umbilicus by way of a patulous urachus. One of the most important of the malformations of the bladder, because of its comparative frequency and obnoxiousness, is the condition known as exstrophy.

Exstrophy of the Bladder.—In this there is an absence of the anterior wall of the bladder and of the overlying structures, so that the internal surface of the organ is exposed. There is usually an absence or partial absence of the symphysis pubis and more or less separation of the pubic rami. The bladder not only communicates with the external world through the abnormal opening, but empties directly into the vagina as well. The posterior wall of the bladder is pushed forward by the weight of the viscera, and shows at the opening as a red, spongy mass. The eversion of the mucosa and exposure to the outer world is what constitutes exstrophy. The ureteral orifices are usually dilated and plainly visible. The urine escapes uninterruptedly, and excoriates the parts over which it flows. The mucosa is inflamed and bleeds easily. These conditions are largely due to the exposure, the contact with clothing and other foreign bodies, and the deposit of urinary salts on its surface.

TREATMENT. — The treatment is radical and palliative. The radical treatment is so technical and withal so uncertain in results that surgeons are, as a rule, content to use such palliative measures as are available.

Palliative Treatment.—Mechanical devices for conducting the urine from the exstrophic bladder to obviate its contact with the skin and mucous surfaces over which it flows have all alike been unavailing. The prime object is to soothe and protect the inflamed mucosa, to obviate the deposit of urinary salts, and to protect the skin surfaces from contact with the urine. The extroverted bladder may be protected from contact with the clothing and extraneous substances by a simple device in the form of a screen. Bathing and douching with warm boric acid solution will prevent the incrustation with urinary salts, while unremitting attention to cleanliness will do much to obviate the irritating effects of the urine on the skin. The skin may furthermore be protected by an application of oxid of zinc ointment, alternated with common white paint. The latter is the best

of all protectives, but its unremitting use might lead to lead poisoning. Adhesive rubber dam may sometimes be used to advantage, but its continued use would lead to maceration and loss of the epidermal epithelium.

CYSTITIS.

Inflammation of the bladder may occur as an acute, subacute, or chronic affection. In its subacute or chronic forms it is by no means infrequent in women, though not so frequent as generally supposed, other affections of the urinary tract, especially the irritable bladder, being mistaken for it. While urethritis is more common in men than women, the reverse holds good with reference to cystitis.

Causes.—Bacterial infection is the principal, if not the sole, cause of cystitis. Other agencies may act as contributory causes and oftentimes produce lesions; but in the absence of bacterial infection such lesions are usually evanescent, and wanting in the characteristics of a genuine inflammatory process. Among the contributory causes are traumatisms (such as kicks or blows), pressure of the child's head in parturition, the presence of vesical calculi, chemicals introduced into the bladder (such as nitrate of silver), urine surcharged with irritating medicaments (such as cantharides or turpentine), or urine which is heavily laden with the urinary salts. Overdistension of the bladder as the result of voluntary effort or from retention is a frequent contributory cause.

Cystitis may be communicated from an adjoining inflamed or otherwise diseased viscus, as in inflammation of the pelvic viscera or cancerous affections of the same. One of the most common causes is direct infection in the act of catheterization, the germs being carried up by a dirty instrument or gathered up by a clean instrument in the act of passing the catheter. Cystitis arising from this cause is much less frequent now than formerly, owing to the wide-spread knowledge of the rôle played by bacteria in the inflammatory process. Despite all this, it is a fact, and a lamentable one, that many, if not almost all, cases of cystitis in women are clearly traceable to faulty methods of catheterization. It is not only necessary that the catheter and the fingers which wield it should be clean, but that the parts with which the catheter is brought in contact and which it traverses should be germ-free. Hence, catheterization should be preceded by a thorough cleansing of the parts in the vicinity of the meatus, and should always be done under the eye, and not by the sense of touch. Some nurses take a false pride in being able to introduce the catheter by

touch alone. This is culpable even to criminality, and should be frowned upon by the physician. The vestibule and the vulva, especially that portion of it in proximity to the urethra, should be cleansed before each catheterization. This may be done by separating the labia with the fingers of one hand and washing the parts with a mild solution of bichlorid of mercury or a stronger solution of boric acid. Medicated cotton is the best medium for application. The catheter is then introduced under the eye.

Even with these precautions an infected urethra may baffle the best directed efforts of the physician or nurse, and cystitis ensue. It

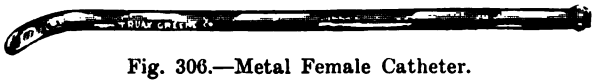


Fig. 306.—Metal Female Catheter.

is because of this fact that physicians are loth to employ the catheter when there is reasonable hope that it can be dispensed with without positive detriment to the patient. Glass or metal catheters are most easily sterilized and are usually to be preferred, though with strict attention to detail the rubber catheter may be rendered practically sterile. After use the catheter should be boiled and kept in a bottle containing a 5-per-cent. solution of carbolic acid. The catheter should

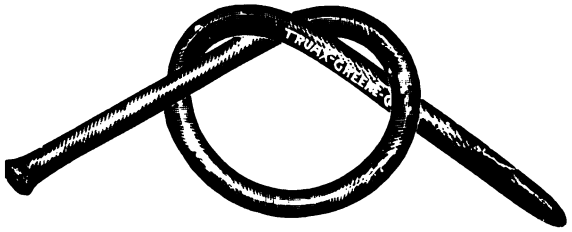


Fig. 307.—Rubber Catheter.

be rinsed before being again introduced. A distended bladder should never be emptied suddenly nor completely by catheterization, as the weakened walls of the bladder are incapable of giving support to the vessels, and the sudden withdrawal of intravesical pressure induces excessive hyperemia, which may lead to hemorrhage, inflammation, or even sudden and fatal collapse.

Morbid Anatomy.—At the outset of the disease in the acute stage the mucous membrane is red, swollen, and hyperemic, and later becomes coated with fibrin, mucus, or pus. The epithelium is detached in places, leaving raw, bleeding surfaces. In the chronic form the

pathologic changes are, as a rule, more pronounced and deeper seated, in many instances involving the entire thickness of the bladder-walls. The mucous membrane is of a dirty-gray color, and the surface is apt to be studded with ecchymotic spots, the result of interstitial hemorrhage. These spots eventually become slate colored, and are quite indelible. The surface is covered or flecked with a tenacious mucopurulent secretion. In some instances the inflammation is localized or disseminated in the form of patches varying in size from the fraction of an inch to an inch or more in diameter. These patches are deeply congested, granular, or eroded, and bleed on the slightest provocation. Such areas are most frequently found at the base of the bladder.

Quite frequently the process goes deeper, forming ulcers of variable size and depth. These ulcers are usually ragged and uneven, and may involve the muscularis or even perforate the walls of the bladder. Exfoliation of the mucosa sometimes occurs in shreds or patches, and in rare instances the entire membrane is shed. In persistent and aggravated cystitis the constant expulsive efforts of the bladder lead to muscular hypertrophy, which, taken in connection with the interstitial inflammatory deposit, greatly increases the thickness of the bladder-walls. The rugæ also become very prominent; so that the entire interior surface of the bladder is conspicuously corrugated and corded. As by reason of the frequent urination the bladder never becomes distended, it gradually contracts, until in many instances it is incapable of holding more than an ounce or two of urine. The urine is usually strongly alkaline and high colored, murky, or milky, though at times it is quite clear. The specific gravity is, as a rule, below the normal. By upward extension along the urinary tract the ureters and kidneys not infrequently become affected. Thickening and compression of the ureteral orifices may lead to more or less complete occlusion, with a resultant dilatation of the ureters and kidneys. The retained fluid may be purulent if the infection has extended upward.

Symptoms.—The cardinal symptoms of cystitis are pain, tenesmus, and frequent urination. There is usually a marked sense of fullness in the region of the bladder. The act of micturition is accompanied by straining and by cutting and tearing pain. There is usually some relief after the bladder has been evacuated; but the sense of discomfort is never entirely absent. In bad cases even after the bladder has been emptied there is a feeling as if the act were incomplete, and the patient will remain long on the vessel in a futile

attempt to expel the last drops. In some cases the suffering is constant and agonizing, and has few parallels for atrocity. The respite gained by emptying the bladder is of short duration, as the bladder is so intolerant that a drachm of the secretion will be sufficient to evoke tenesmus, and from this moment the symptoms become progressively more urgent until the patient is compelled to void it. Oftentimes this occurs every few moments during the waking hours and seldom exceeds an hour or so. The vesical pressure is about three times as great in the erect as in the recumbent position; hence walking or standing increases the discomfort and incites to more frequent urination. Pressure over the pubis or over the base of the bladder through the vagina elicits pain. This is an important indication of cystitis. In some subacute and in many chronic cases where the process is of low grade and not attended by ulceration or other serious lesions, the symptoms are correspondingly less pronounced.

CHAPTER XLIII.

DISEASES OF THE URETHRA AND BLADDER (Concluded).

CYSTITIS (Concluded).

Diagnosis.—In the absence of the equipments necessary to a precise investigation of the bladder and its condition, a diagnosis of reasonable certainty may often be made from the symptoms and gross appearance of the urine. These are frequent and painful urination, with tenesmus; pain on pressure over the region of the bladder, especially through the vagina; and the ropy sediment which collects at the bottom of the vessel after the urine has been allowed to stand undisturbed for a few hours. This sediment, which consists of mucus or muco-purulent matter, is viscid and tenacious. When poured from one vessel into another it crawls over the rim of the vessel, stretches out into a ropy, slimy strand, and falls plump like an oyster. This is almost pathognomonic when found, but in many cases the mucus is deficient or so slight in amount as to be of little aid in forming a diagnosis. Microscopically the urine of cystitis contains pus, blood, and the epithelial cells of the bladder. For microscopic examination the urine should be drawn to prevent admixture with the vaginal secretions. The cystoscope will be valuable in the less severe forms of the disease, as the symptoms may be so masked and the microscopic indications so ill defined as to be of little value. Cystitis should not be confounded with irritable bladder nor with urethro-vesical fissure, to both of which it is closely allied in symptomatology.

Treatment.—In the acute stage the prime object is to secure rest and relieve pain. As the intravesical pressure is greatly increased in the erect position, the patient should be put to bed. The pelvic circulation should be relieved by unloading the bowels and rectum. Especially is it necessary that the rectum be kept free from fecal matter. For this purpose a cathartic should be given at once, and a soluble condition of the bowels maintained by some form of gentle laxative. The salines are preferable, as they act in the twofold capacity of a laxative and depletant. Rochelle salts in 3j doses repeated every three or four hours is one of the most efficient and pleasant of laxa-

tives. Hot water injected into the rectum is a valuable adjunct both as a fecal solvent and peristaltic persuader. It also has a most soothing effect on the inflamed bladder. The water should be introduced slowly so as not to provoke expulsive effort and retained to the point of easy tolerance. The diet should be bland and unstimulating. Meats, highly seasoned food, and stimulating drinks should be interdicted. A milk diet is the best. The urine should be neutralized by appropriate remedies. If acid the citrate or bicarbonate of potassium in 10-grain doses every two hours will be indicated. The benzoate of ammonia in like doses and at like intervals is also very efficient. If alkaline, boric acid will be called for,—10-grain doses every two hours. A very excellent prescription for its soothing and neutralizing effect in acid conditions of the urine is as follows:—

℞ Tinctura hyoscyami . . . . . ʒij.
Liquor potassæ . . . . . ʒiv.
Infusi buchu . . . . . ad ℥vj.
M. Sig.: A tablespoonful every three or four hours.

This prescription does not meet the unqualified approval of the technical pharmacist, in that it contains incompatibles; nevertheless its practical results are most satisfactory. Hot vaginal injections administered as for pelvic inflammatory troubles are grateful and allay suffering.

Subacute and Chronic Forms.—If the acute merges into the subacute or chronic forms, or if the disease has been of such character from the onset, a different line of treatment will be indicated. Here the vesical mucosa is toneless and, in a measure, devitalized. It will require stimulation. In such cases, if the conditions are favorable and the medical attendant capable, valuable evidence may be obtained and occasionally much time saved by cystoscopic examination. Ulceration of the bladder and deep-seated lesions not amenable to ordinary modes of treatment will thus be recognized early and the treatment appropriate to each inaugurated without delay. If, however, the medical attendant is not expert in the use of the cystoscope and none such is available, it would be better to proceed in the ordinary way until the disease is found to be intractable. Bungling interference with the interior of the bladder is fraught with evil consequence. The general treatment will consist in keeping the bowels regular, neutralizing the urine, regulating exercise, and in the exhibition *per os* of the stimulating diuretics, such as copaiba, cubebs, and the essential oils of eucalyptus, turpentine, or sandal-wood.

LOCAL TREATMENT.—The local treatment consists of vesical irrigation, direct applications to localized areas of diseased surface, and the formation of an artificial vesico-vaginal fistula. Irrigation of the chronically inflamed bladder under proper regulations is often serviceable, but it must be admitted that, as usually practiced, it is often disappointing and oftentimes positively harmful. The apparatus for irrigating the bladder should consist of a glass funnel, a catheter, and

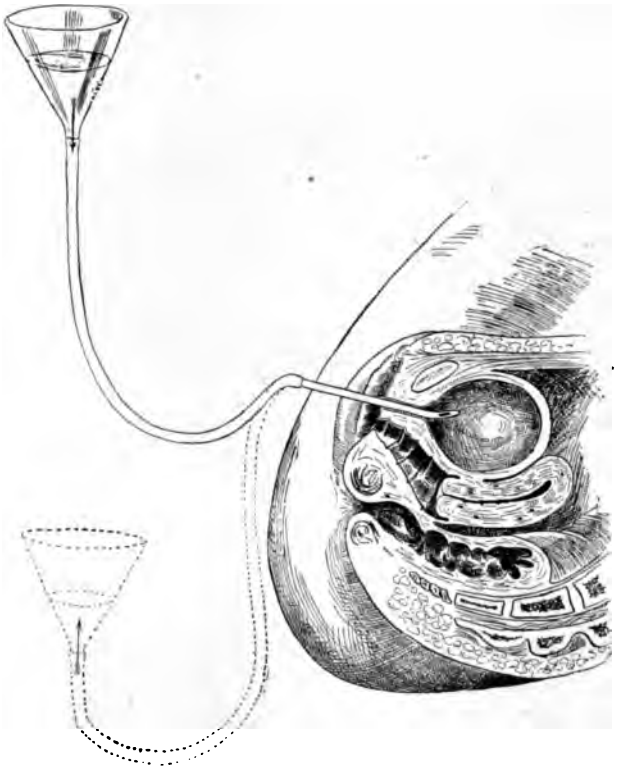


Fig. 308.—Irrigating the Bladder.

a piece of rubber tubing by which these are connected. The whole apparatus should not exceed two feet in length. The rubber catheter is more convenient, though the glass or metal may be used. All the precautions against carrying infection into the bladder should be observed as in catheterization. The fluid should be of a temperature corresponding to that of the interior of the bladder; that is, from 100° to 105° F. The catheter should be introduced and the urine

drawn off by depressing the funnel below the level of the bladder. (Fig. 308.) This should be done slowly, lest it evoke pain. It is not necessary to disjoint the funnel and catheter at any stage of the procedure. By compressing the rubber tube just beneath the funnel the urine which has accumulated in the funnel may be poured off and the funnel refilled with the irrigating fluid. This prevents the entrance of air into the bladder. Now by relaxing the pressure on the tube and elevating the funnel the fluid will find its way into the bladder. So soon as the patient complains of a sense of discomfort the funnel should be lowered to the level of the bladder, and after a moment's time depressed still farther, and the fluid siphoned from the bladder. With the same precautions to prevent entrance of air, the funnel may be emptied and refilled, and the irrigation repeated until the fluid comes away clear. . It will usually be found that the bladder will be quite intolerant at first, so that not more than an ounce of fluid can be introduced at a time. Also at first only one irrigation should be practiced in a day. Gradually the patient becomes accustomed to it, so that both the amount of fluid and the number of irrigations may be increased. It will seldom be expedient to repeat the irrigations more than twice in twenty-four hours. Irrigation should be painless or practically so, and, if not, the procedure is either not indicated or is improperly performed.

The irrigating fluid may be plain or medicated. In the bladder, as in other mucous-clad surfaces, plain water is more irritating than a mild saline solution. The normal salt solution—℥j to the quart—is about the proper strength, though it may be stronger without detriment. A solution of boric acid varying in strength from 50 per cent. to the saturated is often most beneficial. This is the most frequently used and most harmless of all antiseptics. One of the most valuable injections for the chronically inflamed bladder is the solution of nitrate of silver: 1 or 2 grains to the ounce. Occasionally solutions of sulphate of copper of the same strength will give better results. Solution of permanganate of potash, 1 to 10,000, is a favorite with some. When the results of treatment have become manifest in the improved condition of the patient, irrigation may be made at longer intervals and finally discontinued.

Applications through the Cystoscope.—When the disease is confined to localized areas, as in erosion or ulceration, applications made directly to the diseased surfaces are more efficient, and can be used of much greater strength than where the whole interior of the bladder is laved in the medicament. Here the stronger solutions of silver or

copper—gr. v-xx to ʒj—may be used without detriment and often with the most pronounced benefit. The irritable ulcer, which is sometimes agonizingly painful, may be touched with orthoform in the form of solution or powder. The instantaneous effect is severe pain, but this soon gives way to insensibility, which may persist for hours or even days. The stronger local applications should not be repeated more than twice a week.

Cystotomy.—An artificially produced vesico-vaginal fistula is the remedy *par excellence* for the ulcerative and intractable forms of cystitis. It provides for the escape of urine as fast as secreted, obviates

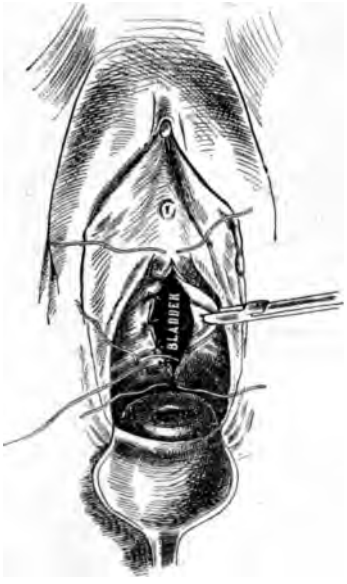


Fig. 309.—Artificial Vesico-vaginal Fistula.

the muscular contractions of the bladder, relieves the pain and tenesmus, and places the organ at rest. Not only is the local effect most salutary, but the patient, relieved from the harassing experience of months or years, becomes imbued with new life and energy, all of which are conducive to the reparative process in the diseased viscus.

Operation.—The patient is anesthetized and placed upon her back or in the Sims position and the perineum retracted. A sound is introduced into the bladder and its beak turned toward the vagina. It should be made to impinge on the bladder-wall in such a way as to push it forward toward the vagina at a point midway between the

internal meatus and cervix and in the median line. Upon this as a guide an incision is made in the median line between the points above indicated and the bladder entered. The incision should be enlarged to the extent of an inch or an inch and a half, care being taken to avoid the internal meatus, on the one hand, and—by keeping in the middle line—the ureters on the other. (Fig. 309.) To prevent spontaneous closure of the artificial opening, to which there is a tendency, the vesical mucosa should be sutured to the vaginal by an over-and-over continuous catgut suture. Kelly recommends the knee-chest

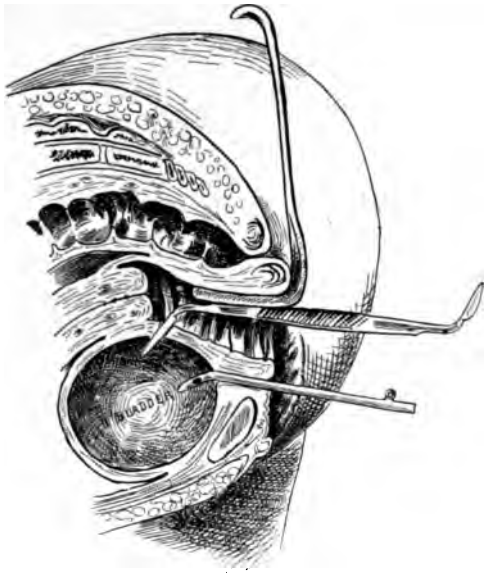


Fig. 310.—Artificial Vesico-vaginal Fistula. (Kelly's Operation.)

position, when by introducing a cannula or catheter through the urethra the bladder becomes distended with air. (Fig. 310.) The incision can now be made without a guide, and in most instances without the use of an anesthetic.

It is seldom in either of these operations that hemorrhage will be troublesome, but, if it should, a suture at either extremity of the incision will effectually control it. To facilitate the healing process and prevent the incrustation of the margins of the wound with urinary salts, the bladder should be irrigated daily with warm boric acid solution. The irrigation should be made through the urethra and care

taken that the artificial opening be kept patulous to afford free exit to the fluid. These should be supplemented with vaginal douches to allay the irritation caused by the urine, which not only flows toward the outlet, but when the patient is recumbent accumulates in the upper portion of the canal. Devices for catching the urine as it escapes from the fistula and preventing contact with the extravesical tissues (the so-called ambulatory urinals) (Fig. 311) are unsatisfactory and often harmful. An absorbable vulvar pad is the most efficient and least harmful device to prevent leakage from the vulva. The fistula should be maintained until the bladder has returned to its normal state. It may then be closed by freshening the edges and uniting by suture.

Fig. 311.—Ambulatory Urinal.

IRRITABLE BLADDER.

This is a condition attended by frequent and painful urination, and is often mistaken for cystitis. There is, however, no organic lesion of the viscus, and its etiology is somewhat obscure.

Irritable bladder is largely, if not essentially, a neurosis. In the great majority of cases it rests upon or is subtended by an unstable nervous organization. Occasionally the irritability finds plausible excuse in the character and degree of excitation to which the organ is subjected. These cases occupy the border-lines between the irritable and inflamed bladder. It is not improbable that some cases of microbic infection, and therefore inflammatory, are classed with the functional disturbance for want of the clinical evidences of inflammation.

In many instances there is a marked hyperemia of the trigone and in the vicinity of the ureteral orifices, but in some even this indication is absent. It should be remembered that the bladder receives its blood-supply from the same source as that of the genital tract, and in large measure is dominated by the same set of nerves. It follows then that disturbances of the genital apparatus are reflected to the bladder. This vascular and nervous community is even farther

reaching, and includes in its range all the pelvic structures, including the rectum and anus. It is a fact well known to gynecologists that one of the most constant and prominent symptoms of pelvic inflammatory disease is that of irritable bladder.

Pressure upon or dragging of the bladder by visceral tumors or swellings, by displacements of the uterus, and by adhesions are frequent causes of irritable bladder. Displacements and disease of the rectum, and especially hemorrhoids and fissure in ano, often create profound disturbance of the bladder, which may take the form of incontinence, retention, or irritability. But of all causes of irritable bladder there is none so prolific as abdominal section attended with handling or mutilation of the pelvic organs. The vesical disturbance is usually in proportion to the extent and density of adhesions and their proximity to the bladder. Abdominal operations not only affect the bladder directly, but also the function of the kidneys. The urine becomes scant and heavy, with increased proportion of the urinary salts, which in their concentrated form are irritating to the vesical mucosa. This is often the principal if not the sole cause of post-operative irritable bladder.

The condition rights itself in from five to ten days, and as the urine returns to the normal the irritation of the bladder becomes less and less marked and in many cases ceases entirely. Nevertheless there are not a few cases in which it will persist for weeks or even months without obvious cause. Irritable bladder dependent on a lowered tone of the general nervous system is one of the enigmas of medicine. Many women of the neurasthenic or hysterical type suffer greatly and persistently, with all the outward indications of cystitis. In this connection it should not be forgotten that the bladder is a storm-center for reflexes, and often acts as the scapegoat for functional dereliction in other and sometimes remote organs. Goodell has dubbed the neurasthenic and hysterical irritable bladder as "Cystitis of the brain."

Symptoms.—The symptoms are frequent and painful urination; pain over the region of the bladder, which is dull, heavy, tensive, or aching; vesical tenesmus, strangury, and sometimes retention or incontinence of urine.

Diagnosis.—The diagnosis will hinge upon the examination of the urine chemically and microscopically and of the bladder by the cystoscope. The viscid, ropy sediment which collects at the bottom of the vessel in vesical catarrh, and which is one of its most conspicuous indications, is not found in the irritable bladder. Albumin, which

is present in cystitis, is here wanting or present in scant quantity. Pus and vesical epithelium—so distinctive of confirmed cystitis—do not exist in the excretions of the irritable bladder.

Treatment.—The treatment consists in removing the cause and diminishing reflex excitability by appropriate remedies. The cause is not always ascertainable, nor its removal always practicable; nevertheless in many instances it is both. The displaced uterus should be restored, pressure relieved, pelvic inflammatory troubles abated, piles and anal fissure appropriately treated, and any other condition which obviously or seemingly bears causal relation to the trouble dealt with *secundum artem.* The vesical irritation following operation may often be, in large measure, forestalled by copious draughts of warm water preceding operation or markedly relieved by rectal enemata immediately following operation. The enemata act in a twofold capacity: the absorbed fluid dilutes the urine and renders it bland, while the hot fluid in the bowel exerts a mollifying effect on the pelvic organs and quiets nervous excitability. The bromids in various forms and combination are probably the best sedatives for general derangement of the nervous system, and may be employed with advantage in most cases of irritable bladder. Some drugs—such as hyoscyamus, belladonna, and buchu—have a specific mollifying influence on the bladder, and are much in demand. They are usually combined with the alkalies because of the general superacidity of the urine; but in case of neutral or alkaline urine they would be clearly inappropriate.

After operation, where it is inexpedient to give medicines by the mouth, they may be exhibited per rectum, either in the form of clyster or suppository. For temporary purposes morphine may be given hypodermically, or opium in some form incorporated in the clyster or suppository. The use of opiates, however, should be reserved for extreme cases, and the drug should be withdrawn at the earliest possible moment, lest the opium habit be contracted. A very effective suppository consists of:—

℞ Ext. belladonna . . . . . gr. vj.
Opii pulv. . . . . gr. xij.

M. et ft. suppos. No. xij.

Sig.: One placed in the rectum every four hours, or at longer intervals as needed.

The irritable bladder of neurasthenia is one of the opprobria of medicine, and is not amenable to any known treatment.

VESICAL CALCULUS.

Vesical calculi are much less common in women than in men. This is, in a measure, due to the facility with which small calculi are expelled through the short and distensible urethra before they have had time to enlarge by accretion. The composition of the stone also varies in the two sexes, the phosphatic variety being most prevalent in women, while the uric acid calculus predominates in men. For this there is no positive explanation. Possibly the more highly wrought nervous organization of woman predisposes to the excessive formation of the phosphatic salts, while the uric acid diathesis is concededly more frequent in man than in woman. Increase of the phosphates under nervous strain is a well-attested physiologic fact. The location of the stone will change with the position of the patient. When the patient is erect the stone gravitates toward the urethral orifice, sometimes blocking it; when the patient is recumbent it falls away. The stone may be sequestered and immovable; thus it may be encysted, occupy a diverticulum, or held between the folds of hypertrophied rugæ. It may be attached to the bladder-wall by having formed around an outgrowth, a suture, or any foreign substance imbedded in the wall.

Causes.—For the reason above stated few vesical calculi have their origin in the gravel derived from the kidney; these are expelled with the first urination after entrance into the bladder. By far the larger number of vesical calculi in women have their origin in the bladder. An abnormal opening into the bladder, as a vesico-vaginal fistula, predisposes to the formation of stone. Emmet claims that the larger proportion of bladder stones in women are found after operation for the repair of vesical fistula. The broken surface along the line of union is probably conducive to phosphatic deposit, and a penetrating suture even more so. The dead space of a diverticulum, with its stagnant urine and altered mucosa, favors the deposit of urinary salts. The normal vesical mucosa, with its normal secretion, is the only safeguard against the deposit of the urinary salts, and any deviation therefrom is liable to be attended by incrustation or calculous formation. Foreign bodies introduced into the bladder by hysterical or sexually perverted women form nuclei for calculous formation.

Symptoms.—The most characteristic symptom of stone in the bladder is the sudden stoppage of flow in the act of micturition. This is due to the stone falling into, or being washed forward against, the

mouth of the urethra. It is more apt to occur in stones of smaller size, as the larger calculi do not fit so closely. The other symptoms are such as arise from the irritation incident to the presence of the stone, and often signalize a co-existing cystitis. These are frequent urination, pain during and after the act, and not infrequently slight hemorrhage. The pain and tenesmus are aggravated by the erect position, by jolting, and by physical exercise. During the day, when the patient is on her feet and actively engaged in her household duties, urination is frequent and the pain unceasing. When at rest in bed these annoyances largely disappear, and she may pass the night in comparative comfort. The hemorrhage, which is usually slight, follows the act of micturition, the blood being bright red and unmixed.

Diagnosis.—A stone being suspected, its presence may be verified by the sound, the finger, or the eye. In using the sound the same precautions to prevent infection should be observed as in catheterization. A sound with a short, broad beak is preferable. The urine should be drawn and the bladder partially filled with a boric acid

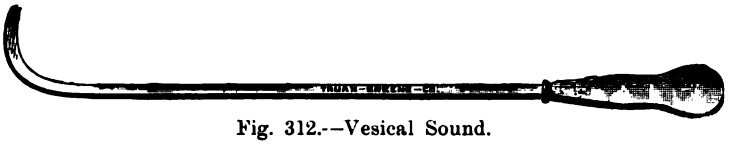


Fig. 312.—Vesical Sound.

solution. The interior of the bladder should be explored systematically with the patient in the lithotomy position. The presence of the stone will be announced by a clicking noise when tapped by the beak of the sound and by a sense of hardness communicated to the hand through the sound. In many instances the stone may be felt through the vesical wall by the finger in the vagina or by a bimanual examination. It may be necessary to have the patient assume various positions in order to bring the stone in relation to the finger. Direct exploration of the interior of the bladder by the finger through the dilated urethra will sometimes reveal an encysted stone or one that occupies a diverticulum after exploration with the sound had failed. Finally the cystoscope may be employed, though this is seldom necessary.

Treatment.—Calculi not exceeding one-half of an inch in diameter may be delivered through the dilated urethra. The delivery should be conducted with patience, gentleness, and tact, to avoid injury to the delicate structures and especially such violence to the urethra as might lead to permanent incontinence. With two fingers in the vagina the stone is coaxed into the jaws of the forceps length-

wise, and carefully manuevered through the canal. In some cases after dilatation the vaginal fingers alone will be able to manipulate the stone into and through the urethra. Stones of larger size may be crushed and washed out.

One of the most simple ways of delivering a stone of the bladder, and certainly the easiest, is to make an opening at the base of the bladder, as in vaginal cystotomy, through which the stone may be delivered with the greatest ease and facility. Should there be a coincident cystitis, the opening should not be closed until after this has disappeared. Otherwise it may be closed at once or be allowed to heal spontaneously.

VESICAL TUBERCULOSIS.

Tuberculosis of the bladder is rare. In most instances it is secondary to pulmonary or renal tuberculosis, or is a local expression of a general tuberculous condition. The *symptoms* are indistinguishable from those of cystitis. Tuberculosis of the bladder may be suspected when the symptoms of cystitis come on insidiously and without apparent cause. Should the patient give evidence of tuberculosis elsewhere, or belong to a tuberculous family, the suspicion of vesical tuberculosis will be strengthened. The post-mortem indications for the early stages are such as would be found in mucous-clad surfaces in other parts; that is, patches of miliary tubercles, which later coalesce, become caseous, and finally ulcerate. In the living subject the cystoscopic findings are, as a rule, unsatisfactory on account of the besmeared surfaces and blood-stained walls. Red patches on the mucosa surrounded by smaller similar patches are highly suggestive of vesical tuberculosis and by some regarded as pathognomonic. At a later stage ulcers take the place of these patches. The only reliable index of vesical tuberculosis is the finding of the tubercle bacillus in the urine. Even here tuberculosis of the upper urinary tract must be excluded by demonstrating its absence in the urine drawn from the ureters by ureteral catheterization. The *prognosis* of vesical tuberculosis is bad, especially if it be secondary or a part of a general involvement. In the primary form, if recognized early, there is scant hope of being able to eradicate the disease.

Treatment.—This is, for the most part, palliative, and follows the same lines as in cystitis. As a specific agent directed toward the tuberculous process itself, iodoform emulsion, topically applied, has apparently done good service, especially in the earlier stages. Not

more than an ounce of the emulsion should be injected at one time, and this should be washed out after the first urination. Cystotomy may allay present distress, and is, in reality, the most effective means of promoting the comfort of the patient; but sooner or later the wound becomes infected and converted into an irritable ulcer. In the primary cases at an early stage curettage of the diseased areas and the application of iodoform may possibly stamp out the disease. Possibly the electric light treatment might be used to advantage here as in cutaneous tuberculosis, though I am not aware that it has been tried nor that it is practicable. Constitutional treatment adapted to the phthisical state should go hand in hand with the topical.

TUMORS OF THE BLADDER.

The most common forms of tumor of the bladder are the papillomatous, or villous, and the epitheliomatous, or cancerous. The villous tumor is non-malignant. It is highly vascular and friable and bleeds easily. It is a branched, or dendritic, growth, and similar to the villous tumors of other parts of the body. It is usually situated in that portion of the base of the bladder known as the trigone. As found, it varies in size from that of a hazel-nut to an orange. It may occur at any age. Cancer of the bladder is usually secondary to cancer of some adjacent organ: the uterus, vagina, or rectum. It may occur as a primary affection. Like the villous growth, its favorite site is in the trigone or in the vicinity of the ureteral openings. It is a disease of advanced age. Cancer of the bladder is more frequent than any other growth.

Symptoms.—Usually the first symptom to attract the attention of the patient is hemorrhage. It is at first small in quantity, evanescent, and appears at the completion of the act of urination. The blood is bright and unmixed. After an interval of weeks or months it is repeated, and finally becomes so frequent and profuse as to excite alarm. Sooner or later the urine becomes stained with the blood which has escaped into the bladder, the blood and the secretion becoming intimately intermingled. It is now of a dark, homogeneous aspect, and does not clear up when allowed to stand. Now, if not before, vesical irritation becomes manifest, which gradually deepens into the complex of symptoms characteristic of cystitis. It is, indeed, a cystitis plus the neoplasm, with all the accompaniments of that distressing disease. Under these conditions the urine becomes darkly opaque, ammoniacal, and revoltingly putrid.

Diagnosis.—The diagnosis is based on the gradual evolution of hemorrhage and cystitis going hand in hand. Hematuria from malaria, parasitic infection, or leucocytosis is seldom attended with cystitis. On the other hand, cystitis pure and simple is almost never attended with hemorrhage so profuse and so long continued. In vesical calculus the hemorrhage usually occurs in the expulsive effort of urination, and there is no time for mixing the blood and urine; they are not intimately blended. The tumor may sometimes be felt through the bladder-wall with a finger in the vagina. Microscopic examination may reveal fragments of the tumor in the expelled urine. The only certain means of diagnosis is by cystoscopic examination, digital examination through the dilated urethra, or an artificial opening into the bladder *per vaginam,* or by microscopic examination of fragments of the growth expelled in the urine or obtained by curettage or otherwise. For differential diagnosis between the villous and cancerous growth fragments of the tissue should be submitted to microscopic inspection.

Fig. 313.—Sajous's Snare.

Treatment.—Pedunculated growths may be either snipped, snared, or twisted off, either through the urethra or cystostomy opening. Sessile and flattened growths may be cut and curetted away. Deep implication of the bladder-wall is a contra-indication to operative interference unless the surgeon is prepared to cut away all the diseased area and do ureteral implantation. The hemorrhage, which is very profuse when the growth is meddled with, quickly subsides after it is ablated. The object, therefore, should be to get at the base of the growth with as much expedition as possible. Should the hemorrhage still be troublesome, pressure with sponges or the application of hot water will usually control it. Adrenalin is one of the most powerful local styptics, and may be used to advantage in such cases. As a palliative measure when radical operation is out of the question, vaginal cystostomy gives the best results. Here, however, it will be prudent to avoid cutting through the growth.

CHAPTER XLIV.

DISEASES OF THE URETERS.

GENERAL CONSIDERATIONS.

THE ureters are tubes with relatively thick muscular walls, two in number, averaging twelve to fifteen inches in length, and about one-eighth of an inch in diameter. They are situated throughout behind the peritoneum, and extend from the pelvis of the kidney, on a level with the second lumbar vertebra, downward in a slight curve to the brim of the pelvis, then downward, forward, and converging inward to the base of the bladder, passing through its muscular walls transversely for three-fourths of an inch and emptying by slit-like openings at the posterior angles of the trigone. In their course they rest upon the psoas muscles, cross the common iliac vessels on the left and the external iliac vessels on the right side, pass below the uterine arteries at a point about three-fourths of an inch from the cervix uteri, and thence through the posterior vesical false ligament to the bladder-wall. The lower portion for two or three inches may be palpated by careful examination *per vaginam* as flat, cord-like bodies diverging outward to the pelvic wall. In diseased conditions they may sometimes be detected above at the point where they cross the pelvic brim. For this purpose a horizontal line is drawn through the superior anterior iliac spines crossing a vertical line drawn upward from the spine of the pubes, and at the intersection of these lines deep abdominal palpation is made.

ANOMALIES.

Double ureters are not uncommon, and are often associated with the lobulated or embryonic type of kidney. The condition may be bilateral or unilateral, and the accessory structures may be patulous throughout, may join the normal tubes at any point along their course, or may terminate in a blind extremity. They may be congenitally imperforate. If both are so affected, prolonged post-natal life is impossible; where the condition is unilateral, the ureter above the point of obstruction becomes widely dilated, sometimes to the size of the small intestine. The implantation in the bladder may be atypical, or one

or both ureters may empty into the urethra or externally in the vicinity of the meatus, giving rise to a constant and most annoying form of urinary incontinence.

INJURIES TO THE URETERS.

Rupture of the ureters may occur as the result of great direct violence, but is of exceeding rarity, and is seldom, if ever, recognized at the time. The diagnosis rests upon the history of injury, followed by hematuria and the development of a fluctuating tumor of the parietes, the nature of which may be shown by aspiration and examination of the fluid withdrawn; or, in other cases, infection may intervene, pointing occur externally, and the urinous character of the discharge proclaim the lesion.

Owing to their relation to the pelvic organs and the readiness with which they may be displaced by inflammatory conditions and new growths, the ureters have been repeatedly accidentally ligated or injured during surgical operations, with often very serious results. If but one ureter is ligated, rapid atrophy of the corresponding kidney usually occurs, and, if the remaining organ is healthy, no other immediate evil may follow other than the loss of an important organ. When both are tied death from uremia will ensue in eight or ten days; or the same fatal termination may follow ligation of one ureter if the kidney of that side is the only actively functionating organ, the other being absent or inactive from one cause or another. Division of the ureter, partial or complete, may also entail grave complications. If unrecognized at the time of operation, and if the peritoneum does not shut off the cut end, the abdominal cavity may be flooded with urine, with peritonitis as a very apt sequence. The latter may sometimes be averted by prompt surgical measures; one such case has come under my observation, where the second day after a hysterectomy the abdominal cavity was reopened, washed out, and a nephrectomy performed, resulting in a complete recovery. If the peritoneum has been so sutured as to shut off the cut end, the escaping urine may form a tumor, as in rupture of the ureter, extensively dissecting up the peritoneum, but with little danger of penetrating it and contaminating the peritoneal cavity, or it may force its way into the vagina, with the production of a urinary fistula.

If the injury to the ureter is discovered before closing the abdomen, immediate steps should be taken to remedy the condition. Formerly, after such an accident the proximal end was implanted in

the loin or vagina, with the establishment of a permanent fistula; so unsatisfactory did this prove that the first formally undertaken and successful nephrectomy was essayed by Simon for the cure of just such a case, and his results led to the recommendation and performance for some years of primary nephrectomy as the best remedial measure. In recent years, however, experimental work demonstrated the great possibilities in ureteral surgery, and developed the operation of ureteral anastomosis, which is now the operation of choice wherever possible, in cases of division or rupture.

Ureteral Anastomosis.—There are three principal methods: (1) lateral, (2) oblique, and (3) end to end.

The first named, Van Hook's operation, is applicable only where there has been little or no loss of substance of the ureter, and is performed as follows: With the site of the break in continuity well exposed and protected by gauze pads, the peritoneum about the severed ends of the ureter is dissected back on each side so as to form flaps for the final step in the operation. The distal segment of the tube is tied with a silk or catgut ligature one-fourth of an inch from the cut end, and beginning one-fourth of an inch below the ligature, with fine, sharp-pointed scissors, an incision is made through all the coats into the lumen, extending downward for a distance equal to twice the diameter of the ureter. The proximal end is next slit longitudinally posteriorly for one-fourth of an inch upward from the cut end with the scissors, and the angular edges neatly trimmed; this is to preserve the patency of the lumen. Two fine, straight, sewing needles, threaded on one fine and readily absorbable catgut suture, are then passed through the anterior wall of the upper segment from within outward, one-eighth of an inch from the end and one-eighth of an inch apart; these needles are next introduced successively through the slit in the lower ureteral segment, into the lumen for one-half of an inch and out through the anterior wall, side by side and one-eighth of an inch apart. Traction on the two ends of the suture will now draw the upper end of the tube through the slit in the lower segment, with its anterior wall snugly up against the anterior wall of the latter, where it is secured by tying the suture. The operation is completed by sewing the peritoneal flaps, mentioned above, in front and behind the joined ends, to protect against leakage. (Fig. 314.)

The Oblique, or Bovee, Operation, requires very careful suturing. It may be briefly described as follows: Both of the ends are cut evenly obliquely with sharp scissors, and the openings slightly dilated for about an inch. The edges are then brought together and held by

three or four fine catgut rectangular sutures, carefully introduced and tied so as to bring about a snug apposition. Between each of these sutures an interrupted reinforcing suture is placed, and the peritoneum disposed about the junction as in the preceding method.

The End-to-End Anastomosis has been advocated after several slightly different methods, of which Kelly's operation is perhaps the most readily performed, inasmuch as the use of a special staff which he devised facilitates the manipulation of the delicate structures. In

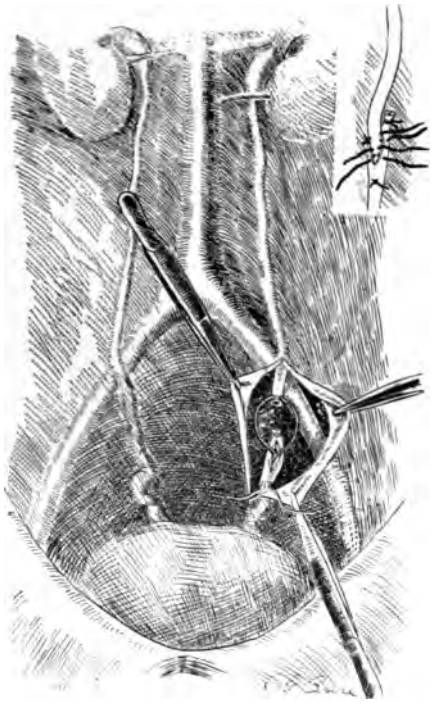


Fig. 314.—Showing Steps of Van Hook's Anastomosis Operation.

this operation the two ends of the severed ureter are first neatly trimmed with sharp scissors and the under surfaces brought together by a fine silk mattress suture. A longitudinal slit is then made in the upper part of the ureter about one-half of an inch from its end, just large enough to admit the staff or guide, and through it the latter is inserted into the lumen and out through the extremity. The lower segment is now slipped on the protruding staff and held by a temporary ligature tied about the lower end of the guide, just back of the bulb. By manipulating the handle of the staff the ureter may be

conveniently lifted and turned so as to allow of the easy insertion of mattress and interrupted sutures sufficient to insure a firm closure. The temporary ligature on the lower segment is then cut, the guide withdrawn through the slit, and the latter closed by two or three interrupted sutures.

URETERITIS.

Inflammation of the ureter is usually secondary to and associated with a like condition of the bladder, kidney, or contiguous structures, but may also occur independently. In the latter class of cases a traumatism of some kind is the chief etiologic factor; thus, injuries received during parturition, rupture, ligation, or division during operation, or from the passage or lodging of a calculus, may all be followed by primary ureteritis. The secondary forms are clinically the more important; the natural resistance of the ureters is considerable; not infrequently infections pass from the bladder to the kidney and

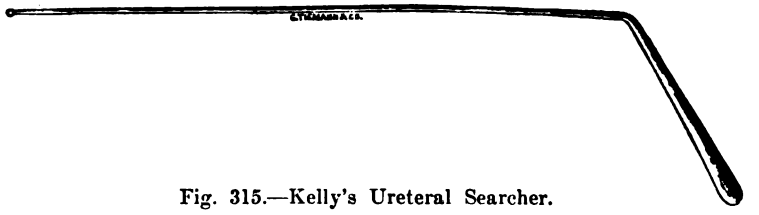


Fig. 315.—Kelly's Ureteral Searcher.

conversely without involving the intermediate structure, but prolonged exposure will often sooner or later result in their being affected. The more commonly active organisms are the pyogenic cocci, the colon bacillus, gonococcus, and the tubercle bacillus. The course is usually chronic in tendency, and when terminating in recovery may leave as a sequel a stricture, which in turn leads to further complications.

Symptoms.—These are frequently masked by the associated vesical and renal disease; the frequent micturition in these conditions is, however, exaggerated until the desire is almost constant, the effort is painful, and the quantity of urine voided at a time is small. The urine may contain pus and blood, but is not especially characteristic. Pain is a prominent feature; it may be a dull, boring sensation along the course of the ureter, varied by attacks of sharp, cutting pain, or paroxysms of renal colic. Examination *per vaginam* often reveals on one or both sides a thick, cord-like structure, sometimes as large as a lead-pencil, diverging to the pelvic walls and exquisitely tender.

Abdominal palpation may also detect the thickened and painful ureters at the point where they cross the pelvic brim, and cystoscopy shows a congested inflamed ureteral orifice, with possibly drops of pus oozing therefrom.

Treatment.—The treatment consists largely in diluting the urine, rendering it bland, unirritating, and antiseptic so far as practicable; relieving the pain, and improving the general condition of the patient. Water should be freely administered, with boric acid or salol in 5-grain doses three times a day. Benzoate of soda, urotropin, copaiba, etc., may be tried at different stages. The diet should be restricted, but nutritious; change of scene, out-door life and exercise may be of great benefit. The bowels should be kept open and alcoholic stimulants avoided. In tubercular ureteritis accompanying a like infection of the kidney requiring nephrectomy, the operation should also include the removal of the affected portion of the ureter. To do this the oblique lumbar incision is extended parallel to the crest of the ilium and downward along Poupart's ligament, as may be necessary, and the ureter dissected out from behind the peritoneum.

STRICTURE.

This condition results from the formation of scar-tissue after wounds of the ureter, ulceration, or other inflammatory processes; the contraction of the cicatrix so originating causes a certain amount of deformity of the ureter, and—more important—a narrowing of its lumen, resulting in a greater or less obstruction to the outflow of urine. The latter occasions in its turn a dilatation above the point of stricture, a condition known as hydro-ureter, and tending to extend progressively upward. A hydro-ureter may be of relatively considerable size and is very susceptible to infection; when the latter occurs, the term pyo-ureter is employed. The diagnosis of stricture, hydro-ureter, and pyo-ureter is usually made from the associated kidney conditions. In the absence of the latter, ureteral catheterization may alone clearly demonstrate the condition by showing the point of obstruction, and if, by careful manipulation, the catheter can be carried beyond it, the immediate outflow of urine under evident pressure, clear or mixed with pus, will prove the presence of the dilatation and the character of its contents.

Treatment.—The dilatation of the stricture by means of bougies has been attempted successfully in some cases, but the most satisfactory treatment, where it can be carried out, is the Fenger operation.

This surgeon makes a longitudinal incision through the scar-tissue and then introduces sutures from above downward, so as to convert the longitudinal into a transverse incision. In cases of almost or quite impermeable strictures it may prove more satisfactory, if the cicatricial tissue does not extend too great a distance along the ureter, simply to excise the narrowest point, and below it make an anastomosis according to one of the methods mentioned.

URETERAL CALCULUS.

A stone may be arrested in its passage from the kidney to the bladder and lodge at some point along the course of the ureter, giving rise to painful and often serious consequences. If the location of the arrested calculus is low down in the ureter,—*i.e.*, in the last three

Fig. 316.—Kelly's Evacuator.

inches,—the recognition of the condition is not difficult. The history of the presence of renal calculus, with an attack of renal colic gradually subsiding and leaving an aching or tenderness along the ureter, should lead to an examination *per vaginam* or by rectum, which may reveal the presence of the offending body. When situated higher up, the diagnosis is not so readily made. The history of the renal stone with the gradually subsiding colic leaving a tender spot may suggest the condition, but often an exploratory incision is needed positively to decide the question. Ureteral catheterization in all cases may be of great assistance in clearing the diagnosis. The results of the lodging of a calculus in the ureter are *primary* in the damage to the structure itself, and *secondary* by obstruction to the outflow of urine. In the first, ureteritis, ulceration, and stricture may occur; and, from the second, hydro-ureter, pyo-ureter, hydronephrosis, pyonephrosis, suppurative nephritis, and general infection.

Treatment.—Surgical measures are always indicated for the prompt removal of the stone as soon as recognized. If located in the bladder-wall, by careful manipulation under chloroform the stone may be expressed into the bladder and thence readily removed. Great care must, however, be used to avoid bruising the tissues, and it will often be best first to dilate the urethra, incise the mucous membrane on one side of the ureteral orifice, and then withdraw or express the stone.

If lodged at a higher point, but within the lower two or three inches, a *vaginal ureterotomy* may be performed. The vaginal mucous membrane is incised at a point opposite the impaction, the ureter located and freed partially from the encircling loose connective tissue, and incised longitudinally to allow of the removal of the calculus. The wound in the ureter is then closed with fine interrupted catgut sutures, gauze drainage inserted to absorb any possible leakage, and the vaginal incision left open enough for the removal of the gauze pack.

Ureterotomy from Above.—If by exploratory incision the impaction is found near the kidney, the endeavor should be made by

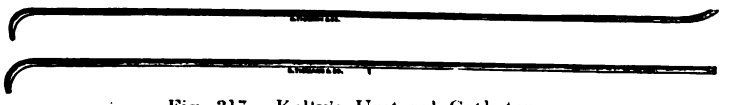


Fig. 317.—Kelly's Ureteral Catheters.

gentle manipulation to return the calculus to the pelvis and thence remove it. If this procedure is impracticable, the ureter is incised longitudinally over the stone, the latter removed, the incision closed by interrupted catgut sutures, and drainage used. If the peritoneum has been opened, the exact closure of the wound in the ureter is of great importance, and the peritoneum itself should be so disposed and carefully sutured as to avoid contamination from possible leakage.

URETERAL CATHETERIZATION.

The present method of catheterizing the ureters under direct inspection has been developed largely by Dr. Kelly, of Baltimore. The procedure is not an easy one, often requiring persistent effort and great patience, although the new cystoscope of Pryor has served materially to lessen the difficulties formerly encountered. The most fruitful sources of failure with the inexperienced are in the lack of placing the patient in the correct position and securing good illumination of the bladder.

Positions.—The object of the special postures employed is to bring about an inflation of the bladder with air; this is of vital importance, and should be considered as the criterion as to when the proper position has been obtained. Two positions may be used: the knee-chest and the dorsal with elevated hips. The first is the better for routine use, and is especially indicated in fat or even moderately large subjects; the patient assumes the ordinary knee-chest posture, with the feet protruding some inches beyond the table, the thighs flexed, not at too acute an angle, but sufficiently to bring the buttocks well back above the edge of the table. The waist should be without any constricting clothing, so as to allow the abdominal wall to drop freely downward without any hindrance; and the introduction of the cystoscope and withdrawal of its obturator should be followed by an inrush of air, due to atmospheric pressure, which widely distends the bladder. If this does not occur there will usually be found some constriction about the waist, from clothing, etc., or the position is faulty.

The dorsal position may be used for thin individuals; in it the patient is placed on the examining table with the buttocks well down

Fig. 318.—Kelly's Ureteral Catheter.

to the edge, the legs and thighs sharply flexed, and with one or two sand-bags inserted under the sacral region so as to raise the hips well up. This has somewhat the effect of the Trendelenburg position, and the insertion of the cystoscope should be also followed by the inflation of the bladder with air.

Instruments.—The following instruments are necessary: A female catheter, urethral dilator, cystoscope, ureteral searcher, suction apparatus (bulb and rubber tube), and ureteral catheters.

Pryor's cystoscope is a modification of the Kelly instrument, and has a great improvement in the fixation of a small electric light at the inner end of the tube, which perfectly illumines the distended bladder. The Kelly cystoscope necessitates the use of a head-mirror and reflected light, which add greatly to the difficulties of the examination.

The external meatus, being the narrowest part of the urethra, sometimes requires dilating before allowing of the insertion of the cystoscope; for this purpose the urethral dilator, a cone-shaped instrument, may be used, but is not often required, as ordinarily a No. 10

cystoscope may be readily introduced, and the use of larger instruments is not advisable.

Method.—General anesthesia may be employed, but, unless there is great irritability of the urethra or undue nervousness on the part of the patient, a pledget of cotton saturated with a 2-per-cent. solution of cocaine, introduced on an applicator into the urethra and allowed to remain for five minutes, will be all that is required. The patient is catheterized and placed in the knee-chest position; after cleansing the external meatus with boric acid solution, and dilating it if necessary, the cystoscope is inserted into the bladder and the obturator withdrawn. The inrushing air thoroughly balloons out the bladder, and the examiner obtains a perfect view of the opposite bladder-wall. A general inspection of the bladder mucous membrane is now made as a matter of routine. To find the ureteral orifices, the cystoscope is partially withdrawn until the internal opening of the urethra just begins to close in over the end; then it is slightly advanced, the outer end directed laterally, to the side opposite the ureter searched for, at

Fig. 319.—Kelly's Bladder Forceps.

an angle of about thirty degrees with the median line, and pressed downward and forward until the inverted floor of the bladder comes into view. In some cases this maneuver will bring the orifice directly into the field of vision, and usually it will be at least in the immediate neighborhood. Often there is considerable difficulty in recognizing it when present, and the searcher is needed lightly to probe what may appear to be the opening, and thus to demonstrate whether or not such is the fact. Sometimes the ejaculation of a few drops of urine will clearly indicate the location of the orifice. After the latter has been satisfactorily established, the long silk catheter, sterilized by soaking in a weak, cold, antiseptic solution and with the stylet in place and working easily, is gently inserted into the ureter for a few inches; an assistant then holds the end of the stylet and the examiner pushes gently, but steadily, sliding the catheter off from the former until the renal pelvis is reached, when the stylet is finally withdrawn.

In the dorsal position the procedure is carried out in practically the same manner, except that, as now the location of the ureteral orifices is reversed in relation to the examiner, the handle and outer

end of the cystoscope are elevated instead of being depressed, and the gaze is directed downward. In this position, the urine, which accumulates during the examination, tends frequently to obscure the field of observation, and must be repeatedly removed by means of the suction apparatus or by pledgets of absorbent cotton.

Careful attention to asepsis should always be paid, especially in the presence of infection of the bladder; in the latter instance before the introduction of the ureteral catheter the orifice of the ureter should be cleansed by swabbing it with a pledget of cotton wet with boric acid solution and applied by means of long, slender forceps.

CHAPTER XLV.

DISEASES OF THE KIDNEYS.

GENERAL CONSIDERATIONS.

In the normal individual the kidneys are two in number, of a characteristic shape, and average in size four inches in length, two inches in width, and one and one-fourth inches in thickness. They are placed one on each side of the vertebral column, about two inches from the median line, and extend from opposite the eleventh dorsal vertebra to the level of the third lumbar, or from in front of the eleventh and twelfth ribs to within two inches of the iliac crest; the left kidney is from one-half to three-fourths of an inch higher than the right. They are situated behind the peritoneum and surrounded by a fatty capsule, which acts as a support or cushion, protecting them from injuries and serving largely to hold them in position. They are very deeply seated, and, though separated by the peritoneum, are in close relation with the main abdominal viscera, particularly, on the right side with the liver above and the ascending colon in front, and on the left side with the spleen above and the descending colon anteriorly; posteriorly they rest upon the psoas and quadratus lumborum muscles. They have a liberal blood-supply through the renal arteries: direct offshoots from the aorta, one for each kidney.

ANOMALIES.

Variations from the normal as to number, shape, size, and blood-supply may occur as the result of disturbed embryonic condition during the second month of development.

Congenital absence of both kidneys has been described as a very rare occurrence; it is usually associated with other misdevelopments or monstrosities. Much less infrequently one kidney may be congenitally absent, usually the left; the one organ present is then larger in size than the average, and is generally quite sufficient for the maintenance of health. The possibility of this anomaly is of great importance whenever the operation of nephrectomy is contemplated; several instances have been reported where inadvertently the only

kidney present has been removed for one cause or another, with necessarily fatal consequence.

Numerous variations in size and shape may occur. The two organs may be fused or joined at the upper or lower extremities, constituting the *horseshoe* kidney; this was found by Preindlsberger to be present six times in one thousand three hundred and forty-four autopsies, and in these cases union of the upper poles occurred five times and of the lower poles but once. The connecting tissue may be either of kidney substance or merely of a fibrous band. The two organs may be dissimilar in size in the same individual, one being enlarged at the expense of the other; they may be lobulated, due to persistence of the embryonic type, varying in degree from slight furrows to deep indentations almost separating the structures into distinct bodies.

In situation, one or both kidneys may be congenitally displaced downward even to within the pelvis. In cases of supernumerary kidneys the third organ has been found projected into the peritoneal cavity, and even against the anterior abdominal wall. The variations in blood-supply are usually merely reduplications of the renal arteries or, more commonly, the veins.

METHODS OF EXAMINATION.

These embrace: 1. Physical examination. 2. Urinary analysis, together with cystoscopy and ureteral catheterization. 3. The use of the x-ray.

Physical Examination.—The normal kidneys cannot be very distinctly outlined, owing to their depth of position. They are most accessible at the border of the erector spinæ muscles, just below the last rib (Treves); here their lower halves project below the costal margin, and careful investigation and manipulation in this locality may reveal departures from the normal in position, size, sensitiveness, and consistency. Anteriorly their position may be approximated by a vertical line drawn from the center of Poupart's ligament upward to the ribs, and crossing at right angles a horizontal line drawn through the umbilicus; the former passes along the long axis of the kidney at the juncture of the outer and middle third, while the latter passes just below the renal border. Any encroachment of the kidney farther to the outer side of the vertical or below the horizontal line will therefore indicate tumor or displacement. At the time of examination all binding clothing should be removed from the patient

and the parts to be manipulated thoroughly exposed. In many cases, particularly in making a differential diagnosis in the presence of a tumor, it will be of service to have the bowels of the patient thoroughly evacuated, especially the ascending and descending colon.

Two postures are most frequently selected: the standing, or erect, and the dorsal, or recumbent. The former is usually employed in the detection of movable kidneys, particularly those of a slight degree, inasmuch as in this position the kidney constantly tends by gravity to drop into the field of examination and thus aid in the demonstration of mobility not otherwise to be discovered. The patient, prepared for examination as above, stands before a chair or table upon which by inclining slightly forward she may lightly rest part of her weight. The surgeon stands to that side of the patient which is to be examined; if the right, he presses the four fingers of his left hand into the loin just below the twelfth rib and rests his thumb anteriorly on the abdomen just below the costal border. The patient is instructed to take a deep inspiration, at the height of which the surgeon presses his left thumb deeply upward under the ribs; during expiration the thumb and fingers are pressed together. If the kidney is movable, it will be felt in the grasp of the left hand entirely below the thumb and forefinger; if pressure is now made with the right hand below anteriorly, and the grasp of the left hand relaxed slowly, the kidney may be felt to slip upward between the thumb and fingers of the left hand into its normal position (Franke).

Bimanual examination may be made as follows: The fingers of the left hand are placed posteriorly in the loin below the last rib, and the tips of the fingers of the right hand are pressed upward and backward anteriorly under the border of the ribs; deeper pressure with the anterior fingers is made during slow expiration after forced inspiration, and the organ, if movable, is caught between the fingers of the two hands. In examining the left kidney in both of the above methods the surgeon stands to the left side of the patient, and the positions of the right and left hands are reversed. In the dorsal position the patient rests on the flat of her back with the shoulders slightly elevated and the limbs flexed so as to relax the abdominal muscles. The methods of manipulation are then carried out in the same manner as in the erect posture.

The same positions are also employed in the use of palpation and percussion for the detection of renal tumors; by means of the former, moderate sized enlargements may be readily outlined, and in thin subjects solid or fluid masses may sometimes be differentiated

by the discovery of fluctuation. By percussion normal kidney dullness will be found to merge above with that of the liver on the right and the spleen on the left side posteriorly, and extends for a couple of inches below the twelfth rib. In new growths the dullness will be increased laterally, downward, and forward, toward the middle line; and crossed from above downward anteriorly by colonic tympany.

Succussion Sign.—Goldflam advises, as an aid in the diagnosis in many surgical conditions of the kidney, the use of succussion after his method, by which he elicits a sensation of pain in the presence of and referable only to a diseased organ. The patient may be seated or standing, with the shoulders bent forward; the surgeon strikes the lumbar region transversely with the ulnar side of his hand a quick, but light, blow, which produces a concussion of the parts not painful

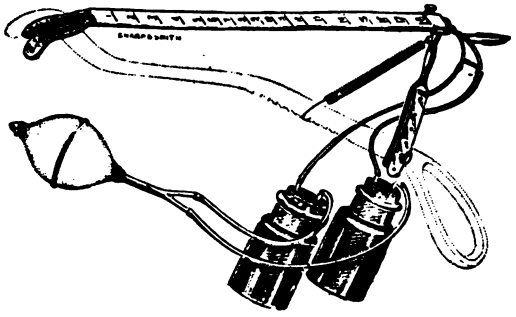


Fig. 320.—Harris's Segregator.

in the normal or non-inflamed kidney, but which is distinctly so in the ordinary surgical renal affections. Affections of the liver, gall-bladder, spleen, or other organs may thus be differentiated, as no pain is elicited by the succussion when such other structures are the seat of the lesion.

Urinary Examinations.—The investigation of the urine in suspected surgical lesions of the kidney is a means of great diagnostic value at the present time, owing to improved methods by which the urine from the two organs may be collected separately. The opportunities for contamination along the urinary tract are so great as to render the urine as voided or as obtained from the bladder by catheter often far from being a true index of renal conditions. The recent developments in instruments and technique by Kelly, Pryor, Nitze, Harris, and others have served to bring to the present high degree

of perfection this most important aid in diagnosis. The urines obtained by the Harris separator are susceptible to some possible contamination, a source of error which is avoided when catheterization of the ureters is practiced. The latter, when carried out by Kelly's instruments and technique, is a matter requiring considerable skill and experience, but when successfully performed yields exact results. By it in pyuria or hematuria the point of origin of the pus or blood may be positively demonstrated, and urine free from contamination may be obtained for bacteriological investigations. Possibly fragments may pass through the tube which will indicate the presence of calculi, and often the presence of a pyonephrosis, hydronephrosis, or a ureteral stricture or closure may be absolutely proved. The Harris separator is not so complete or far reaching in the results obtained; but, from the simplicity of the instrument and the technique necessary for its employment, it has a wide field of utility.

The Use of the X-ray.—This method of diagnosis is applicable in renal surgical affections chiefly in cases of suspected stone in the kidney. Cases have been reported where the presence of a calculus has been successfully demonstrated by the x-ray where other means had failed. Kölischer and Schmidt cite such an instance, and show a sciagraph in which a calculus in the parenchyma is clearly pictured; in this case the patient had been operated upon for suspected stone, the pelvis opened, and the parenchyma needled without the discovery of the offending body.

MOVABLE KIDNEYS.

The kidneys possess naturally a slight range of motility, allowing of an upward and downward movement with the rise and fall of the diaphragm during respiration. Under certain conditions, however, a motility of one or both organs may be noted which is distinctly pathologic, and certain sooner or later to interfere with the proper function of the organ or with the comfort and health of the individual. The frequency with which such movable or floating kidneys may be found in women is not generally appreciated. Gynecologists will usually find 20 to 25 per cent. of their patients with these organs sufficiently movable to produce symptoms, and, if a routine examination were instituted of all women seeking medical or surgical treatment, the percentage would doubtless be still greater.

Etiology.—Females suffer much the more frequently, some records giving the ratio as high as 80 to 90 per cent. of all cases.

The kidneys being kept in place chiefly by the perirenal fatty tissue and the intra-abdominal pressure, it has long been supposed that any conditions which could cause the rapid absorption of the fatty capsule, or would lessen the intra-abdominal pressure, would be essential factors and exciting causes of the abnormal motility. Acute wasting diseases, therefore, and pregnancy and childbirth were the forces that, above all, fulfilled these requirements, and hence have long been cited as the chief factors in the etiology. The activity of pregnancy and childbirth in this direction explained the predominance of the lesion among women, and the *modus operandi* seems, indeed, feasible when one considers the patently relaxed abdominal walls after labor, which must necessarily lessen the normal support of the organs, and which is so often augmented by the injuries to the pelvic floor, with descent or prolapse of the uterus, ptosis of the bladder, or retrodisplacement of the uterus, causing direct traction on the ureters.

Recent developments, however, would appear to disprove the alleged importance of the above, and to place them as forces necessarily aggravating and increasing the condition, but never *a priori* of themselves producing it. Statistics have been compiled showing numbers of cases often of extreme emaciation without the production of motility, and conversely the presence of the latter without emaciation. Also, of the great numbers of child-bearing women, relatively but a small percentage have movable kidneys, while, of the number with the latter, a very fair proportion have never borne children. There would therefore seem to be necessary an individual potentiality or predisposition primarily present in the majority, if not in all, cases. M. L. Harris has developed this theory in this country, and believes that the one necessary etiologic factor lies in a peculiar form of the body which so constricts the capacity of the zone in which the kidneys are normally situated that sooner or later they are inevitably forced downward as being the least firmly fixed organs in that area. Respiration and the other natural movements of the body,—such as lifting, straining, etc.,—which still further contract this zone, surrounded, as it is, by the unyielding ribs, tend gradually to dislodge the kidneys; the movement once started, many other conditions readily augment it. This peculiar body form may be inherited or acquired, the latter probably most frequently by the habit of wearing clothing which constricts the waist. This fact would serve to explain the preponderance of women affected.

Harris further believes that the peculiar body form mentioned may be demonstrated by measurements, and from the relations of

certain of these latter has evolved an *index* which is used to denote the relative areas of the kidney zones, those above a certain figure (81.8) being unlikely subjects in which to find floating kidneys, while those below being very likely to be so affected. He has improved upon Lenhoff's method of taking measurements by selecting more or less fixed bony points, which give much more precise results. For the exact estimation of the capacity of the kidney zone numerous measurements are necessary, but for obtaining the index only two are required,—viz.: the "upper lateral diameter" and the "middle lateral diameter,"—which are procured as follows: With the patient standing, the abdomen exposed and freed from all constricting clothing, the distance is measured with a pair of graduated calipers on a plane through the lower end of the sternum, the end of the calipers being placed on the seventh ribs laterally at the widest point; this is the upper lateral diameter. The ends of the calipers are next placed on the tenth ribs laterally, at the point of greatest divergence, and the distance registered represents the middle lateral diameter. The index is found by dividing the latter by the former and multiplying by 100. In a series of 126 cases observed by Harris, 71 had indices below 81.8, and, of these, all were found to have movable kidneys; all of the remaining 55 had an index above 81.8, and were negative so far as kidney misplacement were concerned. As bearing out the argument in regard to the lack of the activity of pregnancy and childbirth in producing the motility, 40 per cent. of the above positive cases were unmarried and nulliparæ, and the relative number of children *per capita* was slightly greater for the negative cases.

One or both organs may be affected, the latter condition being observed in about 25 per cent. of all cases. The right is by far the more often at fault, owing to its close relations with the liver, as the movement of the latter during respiration is communicated in full measure to the underlying kidney, thus tending to loosen and force it downward.

Injuries of one sort or another have long been popularly regarded as rather frequent and potent factors in the etiology of movable kidneys, probably for the reason that in the clinical history of the case the patients will so often trace the beginning of their symptoms back to some fall or traumatism, and allege these as the cause of their condition. In the majority of such cases the injury may have aggravated an already movable organ, or merely directed the patient's attention to the part. In instances of severe injuries accompanied by symptoms of renal disturbances—as hematuria, etc.—it

is very probable that the kidney may be loosened and a typical movable organ result, but such cases should be considered at present as relatively infrequent.

Symptoms.—These vary greatly in degree and character. Sometimes there may be none whatever, and not infrequently those complained of by the patient are referred to any or all of the abdominal viscera except the kidneys. As a rule, however, the severity of the symptoms bears some relation to the degree of motility. In the first and second degrees of the latter, from where but one-half or more of the organ can only be palpated below the ribs to those where the entire kidney may just be outlined at the same point, the local symptoms are usually a sensation of dragging down and loss of support in the affected side; there may be backache, and often an indefinite uneasiness referred to the lumbar, hypochondriac, or even the umbilical region. Inasmuch as there may be often an associated displacement of the pelvic organs, due to uterine subinvolution, perineal relaxation, or laceration, the symptoms mentioned are often referred to these structures by the attending physician, and the kidney condition overlooked. In the third degree of motility, where the organ may be readily grasped by the examining fingers and pushed down to the pelvic brim or to or even beyond the median line, the symptoms are usually distinct and may be often severe. The backache and distress in the side are exaggerated until they may become unbearable. Dietl's crises may occur; these are paroxysmal attacks of pain resembling renal colic, due to the doubling or twisting of the renal pedicle and often relieved by the patient assuming the recumbent position, or by pressing on the side so as to aid in replacing the kidney somewhat and straighten out the kink in the pedicle. A copious discharge of urine usually follows the attack, due to the release of the fluid which was dammed back by the bend in the ureter. In addition, in all cases well-marked general symptoms may be noted, such as impaired health, languor, debility, vertigo, constipation, neurasthenia, hypochondriasis, and various nervous disturbances.

Treatment.—There are three methods of treatment in vogue at the present time: 1. The rest cure. 2. Bandages or trusses. 3. Operation. The first named consists in keeping the patient at rest in bed and by forced feeding seek to improve the general tone and especially to increase the adipose tissue. Clinical experience indicates the trial of this method in a limited class of cases where the range of motility is slight,—from three to four centimeters,—and where the local symptoms are not severe. The results are not very

encouraging even in these cases. Bandages or trusses of special device are palliative measures with an also limited range of utility; they are used for temporary relief, where severe local symptoms are absent, or where operation is refused or is for some reason inadvisable.

Operation.—Nephrorrhaphy, or nephropexy, is indicated in all cases where a radical cure is desired, after the preceding methods have been tried and failed, where the local symptoms are so severe as to interfere with the health and comfort of the individual, and where the integrity of the organ is threatened by the interference with the outflow of the urine.

CYSTONEPHROSIS.

Obstruction, partial or complete, at any point along the urinary passages will cause a damming back of the urine, resulting eventually in a progressive dilatation of the structures above the site of the obstruction. As the latter may be located at any point along the urinary tract,—in the ureter, in the bladder, or even in the urethra,—there may be an associated condition of dilatation of the ureter, etc.; but the term *cystonephrosis* refers only to a dilated state of the pelvis and calyces of the kidney, and includes two conditions: (1) hydronephrosis, the primary state, when the fluid contained in the dilated sac is urine; and (2) pyonephrosis, when infection has occurred and the fluid contents consist of pus and urine.

HYDRONEPHROSIS.

Hydronephrosis may be congenital or acquired. In the former the obstruction is due to some maldevelopment, such as an imperforate ureter, or an anomalous insertion of the ureter into the bladder or elsewhere, or a valve formation at the uretero-pelvic junction, or the latter junction may be at such an angle as to interfere with the free outflow of the urine. Occasionally the anomaly may involve both ureters, or the obstruction may be at a point below the bladder, in which case double hydronephrosis results,—a condition quickly terminating fatally. The unilateral form is the more common, and may exist for years before its presence is suspected.

Acquired hydronephrosis may be seen more frequently than the congenital form, and may also be bilateral or unilateral. The former is not an infrequent step toward the fatal termination of malignant disease of the uterus; the cancerous process, involving or pressing

upon the two ureters, produces gradually a double hydronephrosis and eventually death from uremia. Other pelvic new growths may occasionally also bring about the same condition. The unilateral form is much more commonly seen. It may result from pressure from without, as by a neoplasm, pelvic exudate, by the gravid uterus, or by uterine displacements; or by diseases within the bladder or ureter, the lodging of a calculus, or stricture due to traumatism or ureteritis. Another frequent cause is movable kidney; the bending or doubling of the ureter incident to the descent of the organ causes an obstruction to the outflow of the urine. With the kidney replaced by pressure or a change of position, as in the patient assuming the recumbent posture, the obstruction is removed, a free discharge of the dammed-back fluid occurs, and the dilatation disappears temporarily, to reappear at some future time. To this condition the term intermittent hydronephrosis is applied. Each succeeding dilatation damages the resiliency of the tissues progressively until the tendency toward periodic evacuation becomes less and less, the weight of the dilated kidney produces more and more of a bend of the ureter, and eventually the intermittent becomes a permanent hydronephrosis.

Morbid Anatomy.—The changes in the production of a hydronephrosis take place slowly, but progressively; there is at first merely a slight dilatation of the renal pelvis, then the pyramids become flattened, the calyces broadened out and shallow; the pelvis becomes almost globular in shape, attached to an atrophied organ. Eventually, in extreme cases, the secreting renal tissue may be so spread out and thinned by pressure as to be macroscopically unrecognizable as kidney substance, and the structure consists of a large, cyst-like body with thin walls, filled with a clear fluid, consisting of a small amount of urine mixed with a serous transudate.

Symptoms.—Subjective symptoms may be entirely absent, or the patient may complain of a sense of weight or uneasiness in the back or side, and, in the intermittent form, paroxysmal attacks of acute pain, which shortly disappear if the patient lies down; such attacks will usually be followed by a copious flow of urine. The chief objective symptoms will be the presence of a tumor arising in the region of the kidney, and extending downward and forward below the ribs as an insensitive swelling, often accidentally discovered by the patient herself. Palpation may show fluctuation; percussion will give an area of dullness corresponding to the tumor and often crossed from above downward anteriorly by colonic tympany; in extreme cases the colon may be displaced to the inner side of the tumor.

Hydronephrosis, if confined to one side, may last for a long time without seriously interfering with the health or comfort of the patient. In other cases the pain and discomfort or the knowledge alone of the presence of a tumor may require prompt treatment. The condition *per se* may not threaten life, but the danger to the integrity of the kidney, and the possibility of infection, with the greatly added dangers therewith, make it a distinct menace to the future welfare of the patient, and indicate early surgical measures. The diagnosis may usually be readily made by the history and the presence of the tumor. Cystoscopic examination may reveal the absence of the flow of urine from one or other ureteral orifice. The Harris segregator may show the failure of the flow from one kidney. Catheterization of the ureters may demonstrate absolutely the impermeability of one ureter, or show a point of compression from without or stricture or valve formation within the ureter, which being overcome by skillful manipulation, a copious discharge of urine ensues, proving beyond question the dilated condition above the point of obstruction. Normally the flow through each ureter will be fifteen or sixteen drops to the minute. Any marked increase in this amount on the introduction of a ureteral catheter would therefore indicate the presence of a collection of urine in a dilated ureter or renal pelvis. I have seen in several instances the urine flow from a catheter in a solid stream, and persisting for several seconds, signifying the presence of a relatively large quantity of the fluid under considerable pressure.

Treatment.—Hydronephrosis being a secondary condition, the ideal treatment consists in ascertaining the cause of obstruction and, if possible, its removal. The relief of diseases of the bladder, removal of calculi from the renal pelvis or ureter, or the extirpation of pelvic new growths or inflammatory exudates may be indicated in some cases. Nephrorrhaphy for movable kidney, resection of ureteral strictures, or plastic operations at the uretero-pelvic junction may be necessary in others. If the dilatation of the pelvis has not been so great or so prolonged as to produce marked atrophy of the secreting tissue, the removal of the obstruction may be followed by a complete recovery, but there is always danger of permanent damage to the organ in all cases of prolonged hydronephrosis. In a certain class of cases the cause or site of obstruction cannot be discovered, or if located cannot be relieved. Also in extreme cases where little or no traces apparently are left of the kidney tissue, or where the resiliency of the structures has been destroyed and the sac tends rapidly to refill, the relief of the obstruction, even if possible, would not result in

restoration of function. In such instances where practicable, the removal of the offending organ is the operation of choice. Aspiration of the fluid contents of the sac has been advised and practiced, but is of very doubtful utility. The operation possesses the only advantages of affording temporary relief and of establishing the diagnosis; the dangers of infection are very great in this procedure, and should be guarded against by the most rigid aseptic technique. Nephrotomy has also been recommended, and, while offering more in the way of results than the preceding, is still practically palliative, and the resulting urinary fistula is a condition that few patients will complacently endure. In some cases the sac may be of such a considerable size and so closely adherent to the surrounding structures that the primary removal would be attended with great risk, or be so difficult as to be inadvisable; in such, a primary nephrotomy may be indicated, allowing of collapse and drainage of the sac, thus making a subsequent nephrectomy much easier of performance. Fenger gives Rovsing's statistics from the literature of 92 operations for hydronephrosis as follows:—

Operation.	Recovery.	Unimproved.	Died.	Total Number of Cases.
Puncture with drainage	1	2	9	12
Nephrotomy	0	15	13	28
Transperitoneal primary nephrectomy .	16	0	3	19
Transperitoneal secondary nephrectomy	7	0	3	10

CHAPTER XLVI.

DISEASES OF THE KIDNEYS (Concluded).

PYONEPHROSIS.

BACTERIAL invasion may take place at any time in a hydronephrosis, producing pyonephrosis, the occurrence of which is promptly manifested by distinctive symptoms. Locally the signs of infection present themselves; the tumor becomes tense and exquisitely tender to pressure, the overlying skin may become reddened and infiltrated, and the patient will complain of severe and often constant pain in the region of the kidney. In cases where the tumor is not demonstrable, the acute pain and tenderness in the lumbar region, together with the general symptoms of infection,—as rigors, irregular fever, and wasting,—will usually clearly indicate the condition. Where there is no history of hydronephrosis the absolute diagnosis may be difficult or impossible without an exploratory incision, but, when such a condition has been suspected or diagnosed, their tendency toward infection should be remembered and should lead to a very lively supposition of the presence of a pyonephrosis upon the advent of the above symptoms.

Treatment.—Without prompt surgical treatment the termination will be almost always unfavorable: death from uremia may occur, or rupture of the sac may take place, followed by peritonitis, if the contents empty into the peritoneal cavity, or by the formation of a perirenal abscess, if posteriorly, with extensive involvement of the surrounding tissues. The sac should be opened through the lumbar incision and thoroughly drained; the cause of the obstruction should be sought and, if possible, relieved. If the kidney tissue is not too widely infected, it may be left *in situ*, with free drainage through the cutaneous incision; but, if multiple abscesses are present, the entire organ is best removed if the patient's condition warrants it. Exceptional cases following stricture of the ureter have been treated by catheterizing the kidney and washing out its pelvis with weak antiseptic solutions. Cure of the pyonephrosis occurred, but the primary condition of hydronephrosis still remained.

RENAL INFECTIONS (SUPPURATIVE NEPHRITIS).

The kidneys are not infrequently the seat of pathologic changes as the result of the action of bacteria and their toxins. Considering their function, however, and the frequency with which various pathogenic bacteria are brought to these organs, local infection is relatively not of very common occurrence; and this fact bespeaks the importance, which can scarcely be exaggerated, of predisposing conditions, such as damage the renal tissue and decrease the active local resistance, in bringing about a state favorable to the lodgment and development of the micro-organisms. Among such predisposing causes hydronephrosis and the presence of a calculus may be regarded as preeminent. In the former the fluid contents of the sac offer an excellent culture medium, and the atrophied or compressed parenchyma is greatly weakened in resistance, the two together forming a combination so exceedingly inviting to bacteria that a sooner or later infection would appear simply inevitable. The presence of a calculus acts practically as an internal traumatism; the rough edges of the stone bruise and irritate the tissues until the local conditions are ripe for the omnipresent microbe. Other predisposing factors may be the presence of poisons in the circulation, either irritating drugs or the toxins of general infections; external violence, producing subcutaneous lesions, such as rupture or laceration of the renal substance, with the formation of an hematocele, or direct stab wounds or bullet wounds, both of which last, with the local damage, might introduce directly the bacteria. Infections of neighboring organs finally may extend to the kidney. The micro-organism most commonly acting as the exciting cause is the bacillus coli communis, alone or associated with the pyogenic cocci. The bacteria of general infection, as the typhoid bacillus and the pneumococcus, may also be occasionally active in renal suppuration. The gonococcus is said to be found only in 3 per cent. of all renal infections (Fenger). The modes of entrance of the organisms, as in any local infection anywhere in the body, may be through the blood or lymphatics, by direct implantation in external wounds, and in extension by continuity or contiguity.

Pathology.—The morbid conditions depend largely upon the predisposing causes and the mode of entrance and character of the bacteria. In the ordinary hematogenous infections incident to a general disease, as pyemia or typhoid fever, the micro-organisms are deposited in various portions of the parenchyma, producing multiple abscesses giving the typical histologic picture, viz.: the septic focus consisting of

bacteria, dead or dying parenchyma-cells, and pus-corpuscles, surrounded by an area of congestion in which are degenerating kidney-cells and multitudes of leucocytes. These small areas increase in size, break down, and often fuse with neighboring foci to form larger abscesses. The entire organ may eventually be riddled with small cavities or be transformed into one or more large ones filled with pus and *débris*. In infections through the lymphatic system or by extension from contiguous structures the suppurative process is more apt to be confined to a portion of the kidney, with the formation of one abscess of moderate size, with often a marked tendency to point toward the pelvis and partially evacuate itself. In penetrating wounds of the kidney with infection the latter will usually tend more or less to confine itself to the tract of the injury; lack of early evacuation or proper drainage may, however, lead to the involvement of the whole organ. In extension of inflammatory conditions by continuity from the bladder and ureter the pelvis of the kidney is first affected. This condition, known as *pyelitis*, is characterized by a distended pelvis containing a quantity of pus mixed with urine and blood. The mucous membrane is thickened and congested, and here and there ecchymoses, ulcerations, or phosphatic concretions may be seen; as the disease progresses the pyramids are compressed and the calyces widen out and become virtually pus-sacs. The uriniferous tubules are distended by the obstruction to the outflow of the urine, and invite farther advance of the micro-organisms; whitish areas appear then along their course, composed of collections of leucocytes, and from these centers the inflammatory processes extend to the epithelium, thence to the adjoining cells, and small circular abscesses result. When this secondary infection of the parenchyma occurs, the term *pyelonephritis* is employed.

Terminations.—Metastatic abscesses of the kidney as a part of a general pyemia merely serve to hasten the death of the patient by adding to the intoxication and materially affecting the excretory functions. Small localized abscesses of the parenchyma may sometimes point in the renal pelvis, the pus discharge with the urine, and spontaneous healing occur; the ensuing cicatrization may produce considerable distortion of the kidney. Spontaneous death of the organisms may also take place, with subsequent inspissation of the pus and calcareous infiltration; or pointing toward the periphery may occur, with the formation of a perirenal abscess. Pyelitis unrelieved, especially the result of obstruction or the presence of a calculus, will usually progressively involve the kidney substance until almost the

entire organ is destroyed. Occasionally one may see at autopsy the two organs affected to such a degree that macroscopically scarcely any secreting tissue can be recognized.

Symptoms.—In acute metastatic suppurative nephritis the local symptoms are masked in the general process. Sometimes a fresh chill or an exacerbation in the temperature will give an indication of a new area involved, and the presence of pain and tenderness in the lumbar region will suggest the invasion of the kidney. Purely local infections in the kidney give rise to general and local symptoms, the association of which more or less clearly indicates the conditions present in a given case. The general symptoms are those of suppuration; irregular fever, higher at night, with morning remissions or intermissions; occasional chills, and often rapid wasting and loss of strength. Locally the patient complains of pain and tenderness in the affected side; on inspection a tumor may appear from beneath the last rib, projecting downward and forward, and in such cases percussion will give corresponding dullness, crossed anteriorly by colonic tympany from above downward. Palpation will develop exquisite tenderness, and may sometimes elicit fluctuation; the overlying skin may be boggy and infiltrated. In cases where the enlargement is not so patent the chief local signs will be an increased area of resistance in the kidney region, with well-marked pain and tenderness. The patient complains of a frequent desire to micturate; voids but a small amount at a time, and with difficulty or actual pain. Attacks or severe pain resembling renal colic may occur at intervals.

The examination of the urine is of great diagnostic value, as a rule, except where stenosis of the ureter on the affected side prevents the discharge of the pus into the bladder. Usually, however, at some time in the history of the case, more or less pus will be found intimately mixed with the voided urine, forming a whitish sediment on standing, and differing in many characteristics from the thick, tenacious deposit of cystitis. The reaction will usually be acid, and albumin may be demonstrated by the appropriate tests; microscopic examination of the sediment will show, in addition to the abundant pus-cells, numerous red blood-corpuscles, tube-casts of various character, epithelial cells from the renal pelvis and tubules, and numerous bacteria. The amount of pus in the urine may vary greatly at different times, as it may collect in the pelvis or abscess-cavities in the parenchyma and periodically discharge in quantity; the reaction of the urine may also vary: while generally acid, particularly in the early stages, it may become alkaline as the disease advances.

In further examination to determine more positively the renal origin of the pus in a case of pyuria, and more especially if renal, whether bilateral or unilateral, and—if the latter—which organ is involved, the use of the cystoscope or the Harris separator will be sufficient in the majority of cases; in more obscure cases, or in all cases where they can be successfully introduced, an absolute diagnosis may be made by catheterizing the ureters.

Treatment.—In the milder cases with but slight general symptoms the expectant plan may yield good results. This consists in diluting the urine by the free ingestion of water, restricting the solid food, and the use of the urinary antiseptics, such as urotropin, cystogen, salol, etc., the patient meanwhile being kept under strict observation so that, if the symptoms persist unduly or increase in severity, surgical measures may be promptly employed. In a few cases pyelitis has been relieved by catheterizing the affected kidney, evacuating the pus, and washing out the pelvis with weak solutions of the bichlorid of mercury (1-100,000 increasing to 1-16,000). This is accomplished by attaching a syringe to the ureteral catheter and alternately injecting and withdrawing a quantity of the antiseptic solution, the amount of the latter being a little less than the estimated capacity of the distended pelvis; after several syringefuls of the above have been used sterile water is injected and withdrawn in the same manner to wash out any traces of the bichlorid. If the procedure is successful, the predisposing causes—as a calculus, valve formation at the ureteropelvic juncture, stricture of the ureter, or hydronephrosis—remain, and a recurrence is not unlikely, but the improvement of the patient's general health and the removal of infection bring about a very favorable opportunity for radical operation for these primary conditions; so that this method of treatment should be attempted wherever possible.

In persistent pyelitis, pyelonephritis, or abscess of the parenchyma where the above modes of treatment have failed, or when the symptoms become progressively worse, a nephrotomy will usually be necessary, opening the pus-cavity from without through the lumbar region, freely incising the kidney substance, evacuating the pus and *débris*, and establishing drainage. Experience has shown that a relatively small amount of normal renal tissue will render good service to the body economy; so that if possible, after the removal of a calculus or other disturbing factor, the thorough cleansing of every pus-cavity and the establishment of sufficient drainage, the organ should be left *in situ*. Wherever, however, the entire organ is too extensively involved, a primary nephrectomy should be performed; or, if the con-

dition of the patient does not permit this, incision, curettage, and drainage should be done, with the idea of a secondary nephrectomy at a later date.

TUBERCULOSIS.

Tubercular disease of the kidney presents certain distinguishing features sufficient to place it in a class by itself. There may be two varieties, acute and chronic, of which the former appertains more especially to the domain of internal medicine, inasmuch as the involvement of the kidneys is simply a part in the general acute miliary tuber-

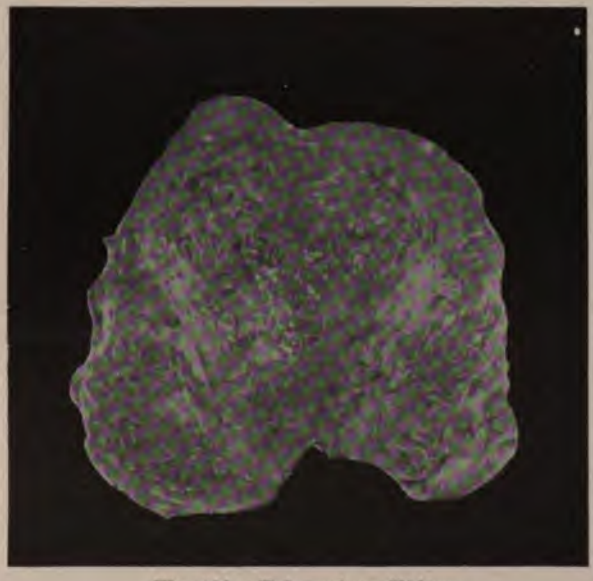


Fig. 321.—Tuberculous Kidney.

cular process, and is, as a rule, overshadowed by the other symptoms, and often only discovered at autopsy.

Chronic renal tuberculosis is not of common occurrence compared with other diseases of the kidney. Statistics showing the relative frequency in the two sexes vary greatly, for the probable reason that more women than men come to the operating-table. Thus, Harris quotes the lists of Tuffier, Albarran, and Bangs to show that, in 378 cases, 66 per cent. were women, while Fenger states from his observations that men are affected with double the frequency of women. Early middle life is the period of choice for the appearance of the

disease; one kidney is first affected, with often a secondary involvement of the other. The development of the disease primarily in the kidney has been described, but it is now generally considered that the local process is secondary to a present active, or previously existing, but now latent, tuberculosis elsewhere in the body. The routes of infection are through the blood-channels or by extension from the bladder or ureter.

Pathology.—The morbid changes occur more slowly than in the other infections. When the bacilli enter through the blood they are deposited at some point or points in the parenchyma and produce the typical tubercular nodule. Early, macroscopically, these appear as pale, indurated areas, shading off into the surrounding tissue. Microscopically they show the central focus of degenerating cells surrounded by leucocytes, epithelioid and giant cells, with neighboring areas of interstitial nephritis. The bacilli may be demonstrated by careful special staining. Soon softening and caseation take place in the centers of the nodules, new localities become involved, older ones break down and fuse together, until one or more large, abscess-like cavities are formed filled with a yellowish fluid, and with a ragged, indurated wall infiltrated with tubercles. Finally the entire organ may become enlarged, indurated, riddled with small cavities, or transformed into one or more large abscesses communicating with the pelvis or with the surrounding tissue, forming, in the latter case, a perinephric abscess. When the pelvis is first affected, as in ascent of the disease from below, the mucous membrane is greatly thickened, ragged, and studded with tubercles; ulceration is common, and here and there phosphatic concretions may be seen.

Although spontaneous healing may occur in the incipient stages by encapsulation, organization, or calcification of the diseased areas, the tendency of renal tuberculosis is too often steadily progressive until the entire organ or organs are involved, and the patient dies of uremia or exhaustion.

Symptoms.—These are often insidious in character, and the disease may be well advanced before discovery. Uneasiness in the affected side may first be noted, increasing to dull pains, varied by sharp spasmodic attacks radiating down the ureter. The kidney becomes enlarged and tender on pressure; pyuria and hematuria usually appear early and are persistent, the pus and blood having the characteristics suggesting their renal origin. The patient has an evening rise of temperature, and loses weight and strength day by day. The differential diagnosis will rest upon the history of tuberculosis else-

where, present or pre-existing; the insidious onset and progressive course; the enlarged kidney with persistent pyuria and hematuria; and, last,—the only pathognomonic sign,—the presence of the tubercle bacillus in the separated urine.

Treatment.—In the early stages general and constitutional measures should be, by all means, first employed. The patient's general health should be improved by tonics, nutritious diet, and, above all, by exercise in the open air. Change of climate may be of great benefit, such as out-door life in the Adirondacks in the summer and in the South in the winter. In addition the usual antitubercular drugs—as creosote, carbonate of guaiacol, etc.—and the urinary antiseptics should be tried. Later, if the general and local symptoms have resisted all treatment and steadily and unfavorably progressed, operation is indicated. At this time, if the disease is confined to one organ, a primary nephrectomy is the operation of choice. Resection of portions of the structure is a doubtful procedure that has been practiced, but should be discarded. Nephrotomy may be done for the immediate and temporary relief of the symptoms where nephrectomy cannot be carried out, as in cases where the process has extended too widely, or if the other organ shows signs of a similar infection.

RENAL CALCULUS.

Stones in the kidney are formed by the precipitation of certain acids and salts normally present in the urine. They have long been supposed to be the result of excessive amounts of these substances present, together with, in some varieties, the action of various bacteria; and hence two classes have been described: the primary, or idiopathic, and the secondary, or microbic. In the former, hereditary tendency, foreign bodies, and the excessive quantities of the substances referred to are mentioned as the etiologic factors in their production. The researches of Harris tend to show, however, that, while these agents may act as predisposing and contributing causes, the actual production of this variety is also due to microbic activity, the chief offending organism being the bacillus coli communis. This bacterium readily finds access to the kidney, and may, without infecting the renal tissue, develop in the urine in the pelvis and cause a precipitation of the uric acid, urates, or calcium oxalate, which results in the formation of the so-called primary stones; the deposit frequently starts about a *nidus* of bacteria, desquamated cells, or other foreign substance. True renal infection has long been conceded as the most active factor in the

etiology of the secondary forms. The accompanying decomposition of the urine precipitates the alkaline salts, ammonio-magnesium phosphate or calcium carbonate, and the infected mucous membrane readily supplies a core or nucleus of fibrin, blood-clot, or desquamated cells, about which they are deposited. Mixed or secondary infection following the presence of a primary stone may result in a mixed form of calculus, the inner portion consisting of uric acid or oxalate of calcium, with one or more phosphatic layers or incrustations.

The shape and appearance of each variety are rather characteristic, although the former depends somewhat upon the site in which the stone is formed, and also as to whether more than one is present. The uric acid stone is usually smooth and oval, of a reddish or yellowish color, and quite hard in consistency, while that of calcium oxalate is spherical in shape, nodular or mulberry-like, dark colored from admixture with blood-pigments, and hard and brittle. The phosphatic calculus is often larger in size than the preceding, irregular in shape, light grayish in color, soft, and easily broken.

The results of the presence of renal calculi may be primary in the pain and distress which they produce, and secondary in the morbid changes they bring about in the kidney, such as causing a hydronephrosis by obstructing the mouth of the ureter, or, by traumatism, inviting further infection. The primary effects are the ones most considered by the patient, although the secondary results are often much more serious as regards life and health.

Symptoms.—A stone may be quiescent for a long time in the kidney, as long as thirty years (Fenger), but generally sooner or later will give rise to serious trouble. The patient will usually first complain of pain in the region of the kidney; this will be a dull, aching sensation, varied by attacks of severe pain, often following exertion or a period of jolting, as in riding or driving. On examination the suspected organ may be found more or less enlarged and tender on pressure; and succussion over the lumbar region is painful. The urine shows a constant or periodic presence of blood, usually intimately mixed with the urine, but, at times, also clots may be found; the hematuria is apt to be more pronounced after the attacks of pain following exercise or exertion. Paroxysms of renal colic are very significant. These are painful spasms of the ureter due to irritation or overstretching as a result of an attempt of a stone to enter the ureter, or by its lodging in the upper portion, or in migrating through into the bladder. They come on suddenly, and may be exceedingly violent; the pain extends along the course of the ureter, and is so severe as to

cause the patient to toss about in bed, to draw up the limbs, and to press upon the affected loin; beads of perspiration stand out on the forehead, nausea and vomiting often occur, and the patient complains of a frequent and painful desire to urinate. After a period of hours or even days, the paroxysm suddenly or gradually subsides; in the former instances the calculus has either slipped back into the pelvis or through into the bladder, while in the latter it has been arrested *en route*, lodging at a place in the ureter indicated by a still somewhat painful point.

Fig. 322.—Mulberry Calculus of Kidney.

The differential diagnosis rests upon the pain and tenderness about the kidney; the hematuria, especially after exertion and jolting; the renal colic, the latter often being followed by discharge of gravel or particles of the calculus; and the use of the x-ray. Rarely a positive opinion may be reached by the use of ureteral catheterization. A catheter tipped with wax is introduced into the renal pelvis and withdrawn; the presence of scratches on the wax may be distinct evidence of the presence of a stone.

Treatment.—Certain expectant measures should always be employed in non-urgent conditions before surgical interference is called for, the line of treatment depending upon the character of the stone

present. In cases with acid urine, with uric acid or urate deposits, the alkaline mineral waters should be freely administered, soda bicarbonate in doses of ½ drachm three times a day may be given, with quantities of plain boiled water and a restricted diet. Piperazin has also been highly recommended. Where calcium oxalate crystals in the urine indicate a stone of that character, much the same treatment may be followed as regards the restriction of diet and ingestion of water. In addition 5 to 10 drops of the dilute mineral acids three times a day and ½-drachm doses of phosphate of soda every few days may be of benefit. The alkaline urine should be rendered acid by boric acid or salol; benzoate of ammonia or the dilute mineral acids may then be given, or urotropin, cystogen, and other urinary antiseptics, with, as in all cases, flushing the kidneys by the imbibition of large quantities (free drinking) of water. By these means together with change of scene, baths, etc., the patient may often be kept quite comfortable for an indefinite period, and in some instances the calculus may be partially dissolved or broken up into fragments, allowing of passage through into the ureter. Or, even if these most favorable terminations do not occur, the further growth of the stone may be inhibited and the kidney freed to some extent from infection, thus favoring subsequent surgical procedures.

Surgical interference will be indicated when the above means fail to prevent recurrent attacks of colic; by the occurrence of obstruction resulting in anuria, where both organs are affected; in hydronephrosis or pyonephrosis if but one is involved; or by the intervention of infection that refuses to yield promptly or produces severe general symptoms. The operations that may be performed are removal of the stone from the renal substance (nephrolithotomy); incision into the pelvis alone for the removal of the calculus (pyelolithotomy); cutting into a suppurating kidney; removing stone, pus, and *débris*, and establishing drainage (nephrotomy); and entire excision of the organ (nephrectomy).

RENAL TUMORS.

New growths of the kidney are not infrequent, a fact due probably to the complicated development of the organ, which allows of malformations and misplacements of embryonic tissue. Both benign and malignant forms occur; the latter, being found most commonly clinically, are of much the greater practical interest. Of the benign tumors, the chief are fibromata, lipomata, and cysts; the first and second are seen most frequently at autopsy, appearing generally as

small, pale, rounded nodules, and of little or no practical significance. Cysts are the result of occlusion of one or more uriniferous tubules, with consequent dilatation of the lumen and atrophy of the lining epithelium and surrounding cells. They may be single or multiple, the latter condition being the more common, as the etiologic factors which produce one will also be active elsewhere in the kidney for the formation of others; two or more may fuse to form larger cysts, varying in size from a few millimeters to three centimeters or more in diameter. They appear usually as bulging, globular tumors immediately beneath the capsule, and contain a straw-colored fluid sometimes

Fig. 323.—Adenoma of Kidney.

thin and watery, in others thick and jelly-like. As a rule, they present no symptoms, and remain unrecognized unless of exceptional size, when, as painless enlargements of slow growth in the region of the kidney, they may be diagnosed by exclusion. Congenital cystic kidneys result from fetal misdevelopment, and—the same causative agents usually operating equally for both sides—the two organs may be involved to such a degree as to be practically functionless. The structures are enlarged, irregular, and characterized by so wide-spread a blocking of the tubules that the parenchyma seems transformed into a honeycombed mass of cysts of various sizes.

Of the malignant tumors, sarcomata are the most common, carcinomata are next in frequency, while adenomata have only occasionally been reported. Sarcoma may occur at any age, but generally appears in the first few years of life or after maturity; it starts as a small nodule, either well defined and encapsulated or shading off into the surrounding tissue. Growth is slow, but progressive, until the patient dies from exhaustion, when the mass may be relatively of considerable size; it is primary in one organ and tends secondarily to involve the other. Primary carcinoma of the kidney is rare, and occurs usually in patients of advanced age. The neoplasm arises in the cortex, rapidly infiltrates the neighboring tissue, and often grows to a large size; it is a pale, soft, nodular, and irregular mass, friable, and tending to degenerate and break down. Adenomata are very rarely met with; one form, described as the struma aberrata suprarenalis, is the result of misplaced suprarenal capsule tissue. These growths, when present, are usually small nodules, and do not always show a malignant tendency.

Symptoms.—The new growth is frequently well developed before distinctive symptoms appear; so that the discovery, often accidental, of a swelling in the loin may be the first intimation of its presence. This enlargement will be found, on examination, to arise in the kidney region, and extend downward, forward, and toward the median line, giving an area of dullness corresponding to its size and position, crossed anteriorly from above downward by colonic tympany. It moves but slightly with respiration, distinguishing it from tumors of the liver, and is rounded and smooth in outline, without either the sharp edge of an enlarged liver or the characteristic notch of the spleen. Pain is not a marked feature early, but may cause considerable distress later in the disease, particularly when of a colicky character due to hemorrhages or the breaking down of the tumor-tissue, resulting in clots and *débris* which attempt to pass through the ureter. Hematuria, early and persistent, is a frequent and significant symptom; microscopic examination may occasionally reveal the presence of the cancer-cells in the urinary sediment. In tumors of great size symptoms indicating pressure on neighboring organs may arise. Cachexia does not become well marked until relatively much later in the course of the disease than when other organs are attacked.

Treatment.—All solid tumors of the kidney of a sufficient size to be palpable should be considered malignant and treated accordingly. Early diagnosis and complete removal of the affected organ give some chance for a cure, but the prognosis is bad in the majority of cases. Metastatic deposits in the other kidney, in the lymph-glands, or else-

where render operation useless, but exploratory incision may be necessary in some cases to determine the fact of such extension of the disease. In operative cases nephrectomy is the operation of necessity, through the lumbar route if possible; but, wherever the mass is of great size, an anterior incision through the peritoneal cavity may be advisable. Benign tumors commonly require no treatment. The removal of a cystic kidney may be indicated if excessive in size, if increasing so as to threaten the remainder of the organ, if the presence of the tumor preys upon the mind of the patient, and if infection takes place.

CHAPTER XLVII.

OPERATIONS ON THE KIDNEYS.

Nephrectomy.—The kidney is accessible for this operation by two routes: the extraperitoneal and the transperitoneal. Of these, the former, through the loin, is to be chosen in all cases where practicable, the exceptions being in cases of enlargements of the organ where the mass is too great to be readily or safely manipulated and enucleated through the posterior incision, and also in very fat individuals or in deformities which lessen the ilio-costal space.

In the transperitoneal operation the cutaneous incision is made in the middle line of the abdomen or along the outer border of the rectus muscle, and the peritoneal cavity opened. Both kidneys should then be carefully palpated, the ability to do which so readily constitutes a distinct advantage for this route, but one not so great as to compensate for its increased danger. The field of actual operation is next exposed and shut off by packing back the omentum and intestines by gauze pads; the colon may usually be pushed toward the median line so as to allow of an incision through the outer layer of the mesocolon, thus laying bare the kidney. In large tumors the colon may be displaced outward; so that an incision through the inner layer may be necessary. With the kidney thus laid bare, the surgeon carefully enucleates it, using blunt dissection only. Dense adhesions may at times be met, and require skillful handling to avoid injuring the neighboring viscera. The renal vessels are plainly located and tied with strong catgut or silk; the pedicle is then cut at a sufficient distance from the ligature to prevent slipping, the ureter tied off, and the kidney removed. In aseptic cases, after securing all bleeding points, the opening in the posterior peritoneum may or may not be closed as the surgeon sees fit, and the abdominal incision is sutured in the usual manner without drainage. Where drainage is required for sepsis or oozing, Terrier, Fenger, and others recommend stitching the edges of the posterior peritoneal incision to the parietal peritoneum or skin and packing the cavity with gauze. Better results will probably be obtained by making a counter-opening in the loin, intro-

ducing the drainage tube or gauze, and closing the anterior opening in the abdomen.

In the lumbar operation several incisions have been recommended, differing but slightly from each other; of these, the *oblique*, in the majority of cases, will prove as satisfactory as any. The patient, prepared for operation, is placed on the sound side, with an air-cushion or sand-bag under the ilio-costal space in order to separate the ribs and crest of the ilium of the upper side, and thus widen the field of operation as much as possible. The cutaneous incision starts at the border of the erector spinæ muscle just below the last rib, and extends downward and forward almost to the iliac crest; the tissues are then divided by splitting the muscles, cutting the fasciæ, and tearing through the fatty capsule until the kidney is reached; after the latter is well exposed it should be carefully palpated, to do which, if necessary, the cutaneous wound should be extended or supplemented by a secondary incision at right angles in order to make more room for manipulation.

In simple cases the kidney may be readily enucleated from the perinephric fatty tissue; but in tuberculosis the capsule is often so fibrous and so densely adherent that the organ can be stripped out only with considerable difficulty, and great care must be exercised to avoid injuring neighboring structures. In malignant tumors as much of this tissue as practicable should be removed with the mass. When the organ has been freed everywhere except at the hilum, the pedicle should be palpated, and, if not found to be infiltrated or adherent, by combined pressure on the abdominal wall and gentle traction through the incision the kidney may be expressed from its site out through the wound, where it is held lightly by an assistant. A blunt aneurism needle, doubly threaded with strong catgut or silk, is introduced between the vessels and the ureter and the former securely tied; the kidney is then cut free, leaving a good-sized button to prevent slipping of the ligatures.

In cases where the pedicle is infiltrated and friable, or so adherent as to prevent delivery of the kidney without danger of tearing through the vessels, a strong clamp may be applied to it and the organ then removed. This maneuver will allow of the placing of the ligatures under direct inspection so as to completely encircle the stump, and avoids the danger in most cases of cutting or tearing through the infiltrated or friable tissue; in some instances even then the placing of the ligatures is attended with such difficulty or with such unsatisfactory results that it will be found safest to discard them entirely

and to trust to the clamp by leaving it in position for forty-eight hours and then cautiously removing it. The ureter, when not infected, is doubly ligated at any convenient point, cut between the ligatures, and allowed to drop back in the wound. In cases with infection the end may be cauterized and fixed in the lower angle of the incision, or, the upper portion, as much as may be indicated, may be dissected out and removed with the kidney; to do this the cutaneous opening should be extended along the crest of the ilium and downward toward Poupart's ligament, as may be found necessary.

After enucleation and removal, careful inspection should be made and all bleeding points arrested, particular attention being paid to the condition of the pedicle. When all is found to be satisfactory, plain gauze packing is introduced, and the wound closed with interrupted sutures, leaving sufficient space for proper drainage and the subsequent removal of the gauze.

Nephrotomy.—The kidney is exposed through the lumbar incision, and palpated carefully to verify the diagnosis. Deep-seated fluid may be tested for with an aspirating needle. If a hydronephrosis exists, the sac should be opened through the convex border of the organ and the contents evacuated. The source of obstruction is then sought and relieved if possible: a stone may be found and removed, a valve formation at the mouth of the ureter slit longitudinally, a ureteral stricture resected, or other measures taken as may be required. If the obstruction cannot be discovered or relieved, a urinary fistula will be generally inevitable; hence a primary nephrectomy may be advisable forthwith. In cases where the condition of the patient contra-indicates this radical measure, or where the obstruction has been successfully overcome, the operation is completed by introducing gauze drainage into the sac and bringing it out through the cutaneous incision, followed by partial closure of the wounds in the kidney and loin by interrupted sutures.

In pyonephrosis, or abscess of the kidney, the cavity should be freely opened up; the contents evacuated; foreign bodies, concretions, stones, or *débris* removed; the walls curetted, and the sac irrigated with warm boric acid or saline solution. The cavity is then packed with gauze, one end of which is brought out through the lumbar incision, and the openings in the kidney and loin partially closed as above to control hemorrhage and hasten healing.

Pyelolithotomy and Nephrolithotomy.—In a few cases, after the kidney has been exposed and palpated as described, the presence of a calculus can be recognized in the pelvis and the latter so brought

forward by careful manipulation as to allow of an incision permitting the extraction of the stone, after which the opening is closed, the organ reposited, a little gauze introduced for fear of leakage, and the operation completed as above. More commonly, however, the calculus is more difficult to locate even if in the pelvis, and an attempt may be made to discover its position by *needling*. This consists in introducing long, fine needles in various directions through the kidney substance, the presence of the stone being recognized by contact. Valid objections are urged against this procedure, inasmuch as a stone in the parenchyma or lodged in a calyx may be entirely overlooked; especially is this the case if more than one be present.

It will be more satisfactory, in most cases, after having established the diagnosis of a calculus, to proceed at once to perform the operation of nephrolithotomy as follows: The patient in lateral position, with sand-bag or air-cushion under the sound side; oblique incision is made; kidney is exposed, palpated, and carefully expressed out into the wound. Firm compression of the renal vessels is made by an assistant to control the entire blood-supply of the organ, and then a clean cut is made by the surgeon along the convex border through into the pelvis, bisecting the kidney; this allows of a thorough inspection of the parenchyma and calyces, easy removal of the stone or stones, and the testing of the patency of the ureter by means of a probe: a by no means unimportant procedure. The operation is completed by closure of the wounds in the kidney and side. In the former, if no infection is present, the edges should be coapted throughout by a double row of interrupted catgut sutures, of which the deeper row are introduced on the lateral aspect of the structure, midway to the pelvis and run directly across to the opposite side. The superficial row include but a small amount of cortical substance, and alternate with the deep stitches. In drawing together the edges and tying the knots only sufficient force should be used to bring about snug coaptation, yet with enough pressure to prevent undue hemorrhage; if drawn upon too strongly, the sutures will cut through the friable kidney tissue. In infected cases gauze packing is inserted, and the wound in the kidney left open just enough to allow of proper drainage. The lumbar incision is closed partially by interrupted sutures, space being left for drainage.

Nephrorrhaphy, or Nephropexy.—This operation was originated by Hahn in 1881, and has been extensively practiced and developed in this country; the technique as perfected by Edebohls in 1893, with some modifications, is the method most commonly followed. The

object of the operation is merely to anchor the kidney at some convenient point of the posterior wall in order to prevent the dragging on the pedicle and bending or twisting of the ureter incident to a floating or movable organ. This point is not necessarily the original position; in fact, as Harris suggests, the repositing and fastening of such a kidney in its primary site is not really the best treatment, inasmuch as the displacement originally was probably due to excessive pressure brought to bear on the organ in an abnormally contracted upper abdominal area, and replacing it merely reproduces the former conditions and subjects the sutured kidney to too great a strain, which doubtless accounts for the rather frequent failures following the operation.

The technique is as follows: The patient is prepared for operation and placed in position as described above. An incision is made along the border of the quadratus lumborum muscle, downward from the last rib, and about three inches in length; the fasciæ are divided and the muscles split downward to the perirenal fat. Noble recommends at this point drawing the fatty capsule downward and outward, incising it as near the spinal column as possible, and then still farther deflecting it down and out; so that at the conclusion of the operation it will be so disposed as to form a cushion below and to the outer side of the sutured organ. The kidney is carefully detached from the capsule everywhere except at the hilum, and brought out through the wound for the insertion of the anchoring sutures. These should be of silk-worm gut, three in number, introduced well into the kidney tissue, but not too near the pelvis, and placed about three-fourths of an inch apart; the kidney is then reposited and the ends of the silk-worm gut are drawn with a needle or carrier through the lumbar muscles on each side of the incision. To insure the disposition of the fatty capsule referred to above, the external ends of the kidney sutures are passed through the fatty capsule first and then through the muscle on the outer edge of the wound. The muscles are then united with interrupted catgut sutures, after which the corresponding silk-worm gut sutures are tied snugly enough to draw the kidney well up, but not so tight as to cut through; last, the subcutaneous tissues and skin are sutured with interrupted catgut, usually in two layers.

Partial Nephrectomy.—The removal of a portion of a diseased kidney has been mentioned in connection with renal tuberculosis and malignant disease, but not advocated as the proper mode of treatment. There may occur, however, cases where, upon an exploratory operation,

the affected tissue is patently limited to but a small portion of the organ and so situated as to allow of a ready excision with good prospects for complete removal of the *nidus morbi;* or it may appear, from the examination of the separated urines, that the opposite kidney is the seat of morbid changes sufficient to damage its working value as an excretory organ, and hence any normal renal tissue of the kidney operated upon will be an important element in the body economy. Under such conditions it may be considered justifiable or necessary to perform the above operation. Experimental work on animals has shown that a partial nephrectomy is neither attended with special difficulties or danger, and that the renal tissue left *in situ* rapidly acquires a greatly increased power of excretion in proportion to its bulk, not only of the watery elements, but also of urea. The operation has been performed several times on the human subject, with a number of reported apparent cures, but further experience must prove or disprove the value of the precedure. At the present time the field for this measure would appear extremely limited, as indicated above.

In performing the operation the chief difficulty lies in the control of the bleeding, and this should be accomplished by the application of digital pressure to the renal vessels by an assistant, as in a total nephrectomy. The diseased area, with a wide margin of the surrounding tissue, is removed in a more or less wedge-shaped mass, so as to leave two corresponding clean-cut surfaces; any large bleeding vessels may then be tied and the two surfaces coapted carefully and secured by through and through interrupted sutures, as after bisecting the kidney. The control pressure of the main vessels is now removed, and, if there is not excessive oozing from the line of incision, the wound in the loin is closed in the ordinary manner with a gauze drain in the lower angle.

Operative Measures for Injuries of the Kidney.—These depend largely upon the special nature of the lesion, and but few general rules may be laid down. The more common injuries are penetrating stab wounds, gunshot wounds, and rupture from severe blows in the loin or violent crushing of the trunk between railway-cars, etc. In all of these there are three indications to be met, viz.: the hemorrhage, the urinary leakage, and the possibility of infection. If the larger blood-vessels have been cut or torn, only very prompt measures for securing the bleeding points will be of any avail. Where the hemorrhage is less severe, palliative treatment may first be tried, such as absolute rest in bed, morphine, ice-bag on the affected loin, etc., but

if these are not effectual and the patient begins to show signs of anemia, or if with the persistent oozing the signs of extravasation of urine become manifest, an exploratory operation for discovering the exact condition of the injured organ should be at once undertaken. In the case of a penetrating wound the original opening should be sufficiently enlarged to allow of a thorough inspection of the track of the injury; in default of such, the usual incision is made in the loin and the kidney well exposed. Any collected fluid should be evacuated, bleeding points secured, and persistent oozing controlled by temporary gauze packing. If the wound is clean cut and does not penetrate into the pelvis, the edges should be sponged dry and coapted throughout with interrupted sutures. If the pelvis has been opened it should be cleansed and carefully examined to see if the distal side has been injured or if the ureter is damaged; if not, the wound may be closed with interrupted sutures without drainage, as in the preceding, or a tube may be inserted, with gauze well packed in about it, to stop the bleeding, and the edges of the wound drawn together as much as is compatible with good drainage. Where infection has occurred, free incision, cleansing, and thorough drainage are the main indications. In gunshot, lacerated, or contused wounds the removal of blood-clots, packing well with gauze, leaving a free communication with the exterior through the loin incision, will usually suffice. Destruction of a large portion of the organ may call for nephrectomy.

Results of Operations on the Kidney.—The immediate terminations of operations on the kidney in death or recovery depend very greatly upon the cause for which the operation is undertaken. Under the improved technique of recent years the kidney may be exposed and explored with comparatively little danger if it is not the seat of serious disease. The ordinary conditions, however, calling for operative measures on these structures are so frequently associated with extensive morbid changes in the one or both organs that the physiologic dangers are thereby greatly enhanced. Thus nephrorrhaphy has a mortality rarely over 1 per cent., while nephrotomy varies from 2 to 40 per cent., according to the cause for operation. Several authors have reported series of exploratory nephrotomies for stone of from thirty to forty cases in which no stone was found, with but one or two deaths; but the same operation—it may be less prolonged and apparently not so severe—in other cases associated with suppurative conditions will show a death-rate of 40 per cent. Nephrolithotomy has a general mortality of 15 per cent.; but, if suppurative and non-suppurative cases be classified separately, the former will equal in

its mortality the preceding, 40 per cent., while the non-septic cases fall to 4 or 5 per cent.

As to the local results, statistics vary considerably, and the data herewith given are only generalizations, and subject to wide differences in the experiences of various operators:—

Nephrorrhaphy *cures* in a trifle over 60 per cent. of all cases. Of the remainder, 10 to 12 per cent. are improved, 10 to 20 per cent. have recurrence of the original trouble, and in about 12 per cent. the operation is unsuccessful. Nephrectomy for malignancy has proved very unsuccessful as a permanent cure in the hands of most surgeons. Israel has reported that out of 11 cases in his clinic there were apparently 3 recoveries. Nephrotomy may occasionally be followed by a urinary fistula; this is rare in cases where there is no obstruction of the ureter, but is not infrequent following this operation when undertaken for hydronephrosis or pyonephrosis, occurring in such cases in from 40 to 50 per cent.

CHAPTER XLVIII.

DISEASES OF THE RECTUM.

ANATOMY.

THE rectum is that portion of the alimentary tract extending from the sigmoid flexure to the anus, and varies in length from six to eight inches. In the adult it is situated entirely within the true pelvis. It begins opposite the left sacro-iliac joint, courses in an oblique direction downward from left to right to the middle of the sacrum, and descends in front of that bone and the coccyx to end in the anus. It is narrower at its upper portion. As it descends it gradually increases in size, and just above the anus expands into a large pouch, which is capable of being distended to enormous proportions. In the infant a great deal of the rectum is in the abdominal cavity; the bowel is nearly straight and occupies a more or less vertical position. The rectum has three coats: mucous, muscular, and serous.

Mucous Coat.—The mucous membrane, or inner coat, of the rectum is very much like that found in other portions of the large intestine. It is paved with cylindrical epithelium and loosely attached to the underlying tissue. In the lower portion of the rectum it is thrown into six or seven longitudinal folds, known as the columns of Morgagni. These folds begin at the muco-cutaneous junction and extend up the bowel one or more inches. Lieberkühn's follicles and circumscribed nodules of lymphoid tissue are found in the mucosa.

Muscular Coat.—The muscular coat of the rectum is much thicker than that of other parts of the intestinal canal, which qualifies it for a most important function: that of expulsion of the feces. It is composed of two sets of fibers: an external, or longitudinal, and an internal, or circular. The longitudinal fibers spread out and form a thick uniform layer; the circular fibers also form a thick layer, and are massed in great numbers about one and one-half inches above the terminal end of the bowel to form the internal sphincter.

Serous Coat.—The peritoneum forms the external covering of the rectum in its upper portion; it then gradually disappears from its posterior, lateral, and anterior surfaces in the order named. As it

leaves the anterior surface of the gut it is reflected, in the female, on to the upper posterior portion of the vagina and the uterus, forming a pouch known as Douglas's *cul-de-sac*. The lower portion of this pouch is situated about three and one-half inches above the anus. This distance may be increased when both rectum and bladder are distended. The upper portion of the rectum is attached to the sacrum by peritoneal folds known as the mesorectum. This, together with the perirectal structures and the muscles forming the pelvic floor, holds the bowel in position.

Submucous Connective Tissue.—The submucous connective tissue of the rectum is very abundant. In it ramify the rectal vessels after passing through the muscular coat.

Arterial Supply.—The arteries which supply the rectum are derived from three sources: the superior hemorrhoidal artery is given off by the inferior mesenteric artery, the middle hemorrhoidal artery from the internal iliac artery, and the inferior hemorrhoidal artery from the internal pudic artery. The arteries in the lower portion of the rectum run parallel to each other in the long axis of the bowel and anastomose by large transverse branches.

Venous Supply.—The veins of the rectum are the superior hemorrhoidal veins, which connect with the inferior mesenteric vein; and the middle and inferior hemorrhoidal veins, which communicate with the internal iliac veins.

Lymphatic Vessels.—The lymphatics of the anus connect with the inguinal glands. Those of the rectum terminate in the sacral and lumbar glands.

Nerves.—The nerves of the rectum spring from the hypogastric, inferior mesenteric, and sacral plexuses.

RECTAL EXAMINATION.

The rectum may be examined by either of the following methods: Manual proctoscopy or instrumental proctoscopy.

Manual Proctoscopy.—Martin, of Cleveland, O., pursues the following course in conducting an examination of the rectum; the patient is thoroughly anesthetized and held in a knee-chest position by an assistant. The surgeon crosses his wrists and extends the index fingers of each hand so that their nails will touch. These fingers are lubricated and introduced into the anus until their ends are beyond the borders of the levator ani. (Fig. 324.) Dilatation of the sphincters is accomplished by kneading and firmly forcing the fingers apart

in the direction of the ischial tuberosities. Slight movements of the head in various directions will enable the surgeon to obtain a good view of the walls of the inflated gut, and a diagnosis of many of the diseases of the rectum may readily be made. The following conditions may seriously interfere with rectal dilatation by this method, and require instrumental proctoscopy: (1) stricture of the rectum; (2) malignant growths; (3) excessive intra-abdominal pressure; (4) a retroverted uterus or extrarectal growth. It is essential that the operator divulse the sphincters in a lateral direction, as traction antero-

Fig. 324.—Manual Dilatation of the Sphincters.

posteriorly will bring the borders of the levator muscles together and prevent a satisfactory inspection.

Instrumental Proctoscopy.—This method necessitates the use of special equipments. The operator should supply himself with a head-mirror, an anoscope, a proctoscope, and a table or chair. The head-mirror should possess a good reflecting surface and be at least four inches in diameter. The anoscope is a metallic cylindrical tube with a trumpet-shaped expansion at its proximal end, to which is attached a strong handle. It is made in various sizes, ranging in length from two to three inches, and from seven-eighths of an inch to one inch in diameter. Its obturator is made of hard rubber or of brass, nickel-

plated. The proctoscope differs from the anoscope only in its length, which is from four to eight inches. The operator should have a good light to work by. This may be natural or artificial. If natural light is utilized, it is better to have a southern exposure. If he depends upon artificial light, a specially devised illuminating apparatus should be obtained, either an Argand burner with a bull's-eye condenser, or, what is better, an acetyline-gas lamp, such as is used on bicycles. The Yale chair, with the improvements devised by Martin, is excellently adapted to rectal work.

The patient is first placed in a Sims or left lateral position for a preliminary ocular and digital examination. The external anus

Fig. 325.—Mackenzie's Condenser.

and surrounding parts should be carefully inspected for fissures, external hemorrhoids, fistulæ, ulcerations, tumors, malignant or non-malignant growths, venereal excrescences, mucous patches, pediculi, or seat-worms. The finger should then be passed into the rectum and the lower portion of the gut examined. Note whether the sphincters are contracted or relaxed, or if there is any anterior or posterior displacement of the bowel-wall. Pushing the finger on into the distensible portion of the rectum, palpation is practiced: first of the mucosa, then of the deeper structures. Ascertain whether the mucosa is hot, moist, or dry; whether ulcerations, strictures, or growths are present; or whether there is any indication of a perirectal inflammation or an abscess. Having completed the digital examination, the

anoscope should be introduced. The patient is changed to a knee-chest posture, and the instrument, being well lubricated, is gently pushed into the rectum; this may be facilitated by having the patient bear down. After the anoscope is in place the obturator is withdrawn, allowing the air to rush in and inflate the rectum.

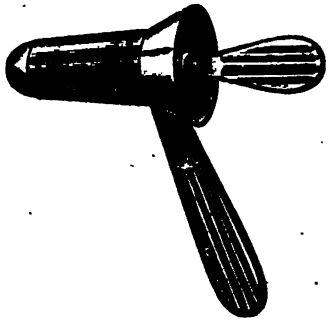


Fig. 326.—Anoscope.

If the examiner now concentrates the light by means of the head-mirror on the mucous membrane of the bowel he will perceive, if it is normal, that it first appears moist and of a bluish-gray color. As it dries, the color changes to a pinkish tint, and finally assumes a yellowish-white appearance. Diseased conditions of the membrane subject it to various changes in color. If the trouble is located too

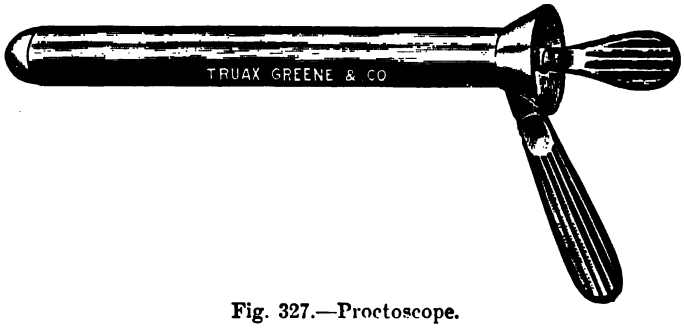


Fig. 327.—Proctoscope.

high up in the rectum to be brought into view with the anoscope, the proctoscope should be used. This is introduced in the same manner as the anoscope, except that when it has passed the fixed portion of the gut it should be directed toward the sacral promontory and afterward into the hollow of the sacrum. By this means rectal tumors, strictures, fistulæ, and ulcerations, if present, can readily be brought

under the eye. Through it the surgeon can note the amount of rectal distension, and the condition, position, and number of the rectal valves. These valves vary in number from two to four; usually there are but three. They divide the rectum into several chambers, the number of chambers corresponding to the number of valves. The highest valve is invariably situated at the sigmoid flexure. The other valves situated between this and the anus usually alternate in position, one being on the right and another on the left side of the gut. They may sometimes appear on the anterior and posterior rectal walls.

ABSCESS OF THE ANUS.

This condition may arise from traumatism, an inflamed thrombotic pile, or suppuration in one of the crypts of the anus. The parts become somewhat indurated and swollen, and at times very painful.

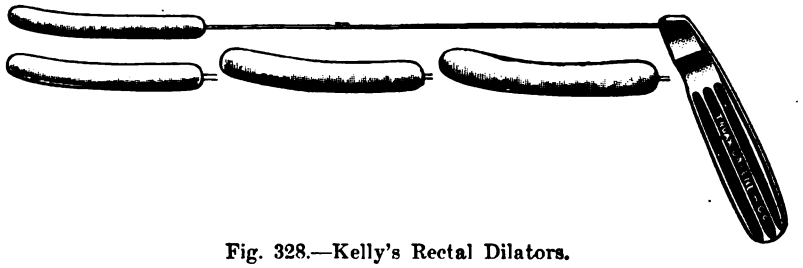


Fig. 328.—Kelly's Rectal Dilators.

As pus forms, the tissues become softened, and fluctuation may be perceived. Constitutional symptoms are frequently present.

Treatment.—A free incision should be made, and the cavity evacuated, well irrigated with an antiseptic solution, and packed with strips of sterilized gauze. The after-treatment consists in keeping the parts cleansed and reapplying fresh dressings when necessary.

EPITHELIOMA OF THE ANUS.

This disease may spring from either the cutaneous or mucous surface of the anus. In its initial stage it is nodular, indurated, and indolent; later it ulcerates and invades the deeper structures. Care should be exercised not to mistake it for one of the benign neoplasms.

Treatment.—If the trouble is localized, free excision of the skin and mucous membrane should be performed and their edges brought

together with catgut sutures. Extensive disease will demand rectal excision.

STRICTURE OF THE ANUS.

This affection may be congenital, traumatic, or malignant in character. Digital examination will divulge a contracted orifice, which may or may not admit the passage of the finger. The stools are molded while being expelled through the constriction, and assume a tape or ribbon-like appearance.

Treatment.—Traumatic stricture should be treated by gradual dilatation with the fingers or rectal bougies. In the malignant form the growth should be thoroughly removed.

SPHINCTERISMUS.

Spasm of the sphincter muscle usually results from an ulcer or fissure of the rectum. It may also be brought about by a cystitis or a proctitis, and in some cases no cause can be determined. It is accompanied with a great deal of pain.

Treatment.—This consists in removing the cause. If this cannot be ascertained, forcible dilatation of the sphincter muscle with the fingers, under general anesthesia, will usually be effective.

PRURITUS ANI.

This condition is characterized by an intense itching of the anal tissues. Where the disease has persisted for a long time the integument becomes thickened, indurated, and much excoriated. The constant use of the finger-nails results in numerous abrasions. The parts are also macerated, owing to a greater or less transudation of serum. Pruritus ani may result from eczema, seat-worms, rectal prolapse, internal hemorrhoids, or external fistula. It may also be due to a neurosis or to some constitutional disturbance, such as a lithemic or gouty diathesis.

Symptom.—The most prominent symptom is an intense itching, which is usually increased when the patient is in bed.

Treatment.—Some of these cases are exceedingly obstinate. The cause should be discovered and removed. If a fistula is present, it should be opened up and curetted. Internal hemorrhoids should be ligated and removed. Eczematous affections require the application of appropriate remedies, the following ointment being sometimes efficacious:—

℞ Resorcin . . . . . gr. x.
Ichthyol . . . . . 3ij.
Cold cream . . . . . 3iij.
Lanum . . . . . 3iij.

M. Sig.: Apply to parts morning and night on absorbent cotton.

In all cases the bowels should be regulated either by salines or small doses of calomel and soda. A solution of nitrate of silver, 60 grains to the ounce, applied freely to the surface, will frequently give good results. Very hot water brought in contact with the parts often answers admirably. For temporary relief a 4-per-cent. solution of cocaine or an 8-per-cent. solution of menthol in liquid vaselin may be used. Samways reports a number of cases of pruritus ani in which collodion was used with excellent results. Where no cause can be discovered the diet should receive attention and the case treated symptomatically. Lithia-water is sometimes of benefit.

DISPLACEMENTS OF THE RECTUM.

In women the rectum may be displaced forward, backward, or downward. These are, respectively, termed anterior rectocele, posterior rectocele, and prolapse.

Anterior Rectocele.—This is a protrusion of the anterior wall of the rectum forward; it carries the posterior wall of the vagina before it, and presents as a tumor in the vaginal canal. This condition is usually the result of a laceration of the pelvic floor sustained during childbirth.

TREATMENT.—It may be rectified by Emmet's operation.

Posterior Rectocele.—A pouching of the posterior wall of the rectum is known as a posterior rectocele, and is of not infrequent occurrence. Any traumatism affecting the integrity of the levator ani muscles tends to produce a lack of rectal support and conduces to a descent of the gut; therefore the passage of feces does not take place in the normal direction, but the contents are forced into the sacculation of the posterior wall of the rectum and increases the defect.

SYMPTOMS.—The symptoms manifested are pain, tenesmus, and difficulty in unloading the bowel of the hardened feces, which accumulate in the pouch. Digital examination will divulge a posterior pouching of the rectum just beyond the external sphincter.

TREATMENT.—The treatment consists in repairing the primary lesion and in returning the gut to its natural place. The operation devised by Charles A. L. Reed, of Cincinnati, has given good results in

these cases. He utilizes the Emmet operation for the deep perineal tears, and in addition pursues the following course: A transverse incision is made equidistant from the anus and the tip of the coccyx. This incision must not involve the external sphincter. It may be from one and one-half to two inches in length. The tissues are dissected until the posterior wall of the rectum comes into view, which is separated up to a point beyond the levator muscle. The relaxed gut is then pulled above the levator ani, to which it is anchored with several interrupted catgut sutures. The external wound is closed and sterilized dressings applied.

Prolapse of the Rectum.—Where the mucosa alone descends and projects from the anus it is known as a partial prolapse, or prolapsus ani. Where all of the rectal coats protrude it is termed complete prolapse, or prolapsus recti. As the mucous membrane is very loosely attached to the muscular coat of the bowel, this condition no doubt predisposes to a partial prolapse. Children are more susceptible to prolapsus ani than adults, although it may occur at any age.

Etiology.—Partial prolapse of the rectum may result from protracted constipation, dysentery, hemorrhoids, rectal growths, vesical calculus, strictured urethra, hypertrophied prostate, or any pathologic condition causing violent straining during micturition or defecation.

Symptoms. — The mucous membrane when protruded during defecation will have a reddish appearance, and present a number of folds with depressions between them. Reduction usually takes place simultaneously with the cessation of the expulsive efforts. If this fails to occur strangulation may ensue. The mass, if not soon released from the grasp of the sphincter, may become gangrenous, its color changing from a reddish to a mahogany or brownish cast.

Diagnosis.—Partial prolapse of the rectum is usually not hard to diagnose, although at times it may be mistaken for hemorrhoids or some of the pedunculated growths of the rectum. In hemorrhoids the protruding rim of the bowel is less regular in outline and lobulated. The piles are furthermore darker hued or livid, the color being accentuated at their apices. A pedunculated growth occupies only a portion of the rim of the bowel, and upon examination will be found attached to some portion of its circumference.

Complete Prolapse.—When the sphincter and levator ani muscles have lost their contractile power, complete prolapse of the rectum may occur. This may result from a persistent partial prolapse or appear suddenly from excessive straining at stool. General debility and relaxation of the perineal structures due to repeated pregnancies

may also conduce to it. If the protrusion is very large, the peritoneum may be dragged down and occupy a portion of the prolapsed bowel. This possibility should always be borne in mind at the time of operation on these parts. In a few instances a large portion of the colon was found in the mass. In complete prolapse the tumor assumes a globular form, and is covered with mucous membrane with deep sulci encircling it.

TREATMENT.—The treatment of rectal prolapse may be palliative or operative. The palliative treatment consists in the immediate reduction of the protrusion. This can best be achieved by placing the patient either in a Sims or knee-chest position and, with fingers well lubricated, performing gentle taxis upon the prolapsed portion

Fig. 329.—Rectal Supporter.

of the gut. To maintain the reduced bowel in its normal position, and to prevent a recurrence of the prolapse, a firm pad should be placed over the anal aperture and held in position by a T-bandage or a supporter. The patient should not be allowed to assume an erect position while defecating, and must avoid all straining efforts. The bowels should be kept soluble by the administration of mild laxatives. Local injections of such astringents as tannic acid, hydrastis, and alum are useful adjuvants to the treatment.

℞ Tannic acid . . . . . gr. xx–xxx.
Water . . . . . ℥vj.

M. Sig. : To be injected after being cooled with ice.

The primary cause must be located and remedied if a cure is to be effected. Thus, a stricture, a calculus, or a growth, if present,

must be removed; a diarrhea, dysentery, or constipation corrected; and the general condition of the patient toned up. If these measures fail to correct the trouble, radical treatment should be employed.

The operative treatment of rectal prolapse consists in the use of: (1) nitric acid, (2) the actual cautery, (3) the clamp and cautery, or (4) excision of the protruding mass.

Nitric Acid.—Cauterization of the mucous membrane of a prolapsed rectum by nitric acid, as recommended by Allingham, insures better results in children than in adults. In a large number of cases one application will suffice. A rectal injection is first given to empty the lower bowel. The patient is then anesthetized, and the integu-

Fig. 330.—Cauterizing Prolapsed Bowel.

ment surrounding the parts to be cauterized well protected from the action of the acid by an application of vaselin. The entire mucous membrane of the prolapsed part should be cauterized by applying nitric acid to its surface. The cauterized area is then covered with some soothing ointment and the prolapse replaced. One drawback to this method is that occasionally it will be followed by extensive sloughing, stricture, or hemorrhage.

Actual Cautery.—To Van Buren must be given the credit for this method. The patient is anesthetized and placed in a lithotomy posture. The protrusion is drawn down, and from four to six longitudinal furrows are made in the mucous membrane, extending from the apex to the base of the prolapse with the cautery at a cherry-red

heat. (Fig. 330.) As the sphincter is approached, the cautery should be sunk deeply into the tissues so as to cause contraction of that muscle if it be too much relaxed. The procident bowel is then replaced and a compress applied supported with a T-bandage. If much pain follows the operation a suppository of cocaine, orthoform, or opium may be introduced. Rest in bed is imperative until the parts are entirely healed. The contraction resulting from this operation tends to shorten the rectum, and at the same time diminishes its caliber.

Fig. 331.—Cautery Iron.

Clamp and Cautery.—This method consists in clamping the mass in longitudinal sections and burning the projecting folds with the cautery.

Circular Excision.—This operation may be selected for cases of very large or irreducible prolapse. A circular incision is made at the muco-cutaneous junction down to the submucous tissue. The prolapsed mucous membrane is next dissected or stripped off as far down as the apex of the mass. The remaining tissues of the prolapse are

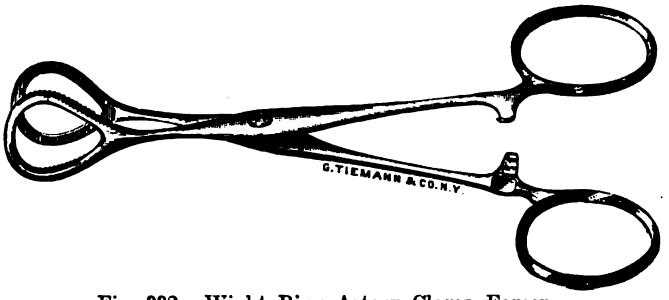


Fig. 332.—Wight Ring Artery Clamp Forceps.

now completely severed at the level of the anus, the anterior wall being first divided. This opens the peritoneal cavity, which should be closed before the posterior wall is severed. The proximal end of the gut is immediately seized with compression forceps and held down until it is attached to the anal margin with catgut.

W. J. Chapman reports a case of rectal prolapse in which an abdominal section was made and ventrofixation of the mesorectum practiced with satisfactory results.

PROCTITIS.

This disease is a localized catarrh of the rectum, and may be classified as catarrhal, dysenteric, and gonorrheal.

Acute Catarrhal Proctitis.—This may arise from external violence, the presence of foreign bodies in the gut, hardened feces, harsh purgatives, or prolonged chilling of the parts; it may also be brought about indirectly by a growth, prolapse, or stricture of the rectum. It generally occurs in the young, and is usually confined to the mucous membrane, but may, occasionally, extend to the deeper structures about the rectum and set up a periproctitis, resulting in ischio-rectal abscess and fistula.

SYMPTOMS.—Acute catarrhal proctitis may give rise to more or less pain, localized in character; tenesmus; tenderness on pressure in the anal region; irritability of the bladder; frequent passages of mucus, mixed at times with blood; and occasionally rectal prolapse, the result of straining. There is usually slight febrile disturbance.

DIAGNOSIS.—Examination of the rectum with the anoscope will show a highly congested and dry mucous membrane in the atrophic form, or a spongy mucosa bathed in an excess of mucus in the hypertrophic variety.

Chronic Catarrhal Proctitis.—This may result from acute catarrhal proctitis, rectal growths, or uterine displacements.

SYMPTOMS.—These are about the same as in acute catarrhal proctitis, but of modified intensity.

DIAGNOSIS.—Thickening and induration of the mucous membrane, with ulcerated areas, are characteristic of this stage of the disease. Proctitis may sometimes be mistaken for hemorrhoids or malignant disease of the rectum. Digital and anoscopic examination of the rectum will divulge the presence or absence of hemorrhoids. Cancer of the rectum usually develops slowly, and the feces when expelled assume a ribbon-like form. The cachexia and odor, together with the nodular or ulcerated mass, will confirm the diagnosis of malignant trouble. In uterine displacements a bimanual examination will determine the position of the uterus.

PROGNOSIS.—An acute attack of catarrhal proctitis usually lasts from one to three weeks if early treatment is instituted; if neglected until it becomes chronic, it may continue indefinitely and result in ulceration and stricture.

Treatment.—In the acute form the patient should be put to bed and thorough evacuation of the bowels obtained by castor-oil or saline

purgatives. The diet should consist of milk, broths, soups, and soft-boiled eggs. Hot or cold injections of sterilized water are usually well tolerated in the rectum and give much relief. If the pain or straining efforts persist after the rectum has been emptied, an injection of tincture of opium and starch-water may be given or an orthoform suppository introduced. Hot hip-baths are very soothing. In the chronic form the above treatment should be supplemented by the use of astringent injections. A solution of nitrate of silver, gr. v to ℥ij of water, may be thrown up into the rectum and allowed to remain for several minutes; this is to be flushed out with an injection of sterilized water. Solutions of zinc, lead, or alum may also be used

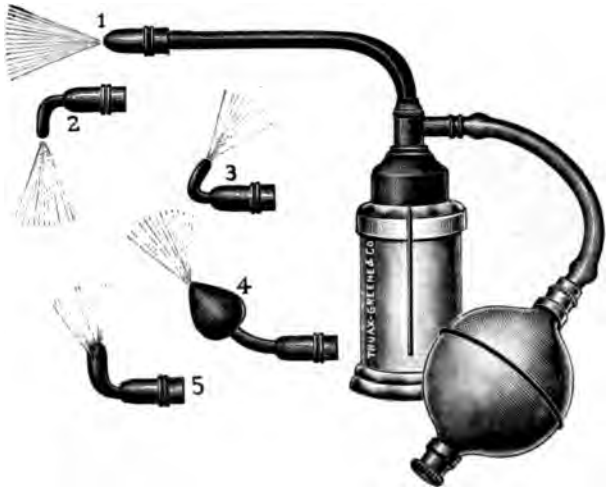


Fig. 333.—Truax's Atomizer.

with good results. Medicaments may be applied to the mucous membrane of the rectum through the proctoscope in the form of a spray with a hand-bulb or compressed air nebulizer.

Dysenteric Proctitis.—This variety is very seldom found in this climate, but is of common occurrence in the tropics. It frequently results in ulceration of the rectum. Dysenteric stricture is extremely rare.

Gonorrheal Proctitis.—Gonorrheal infection of the mucous membrane of the rectum occurs more frequently in women than in men. Owing to the propinquity of the rectum to the vulva and the vagina, its mucosa is extremely liable to become infected by the secretions of

a gonorrheal vulvitis or vaginitis. Unnatural intercourse with a male afflicted with a specific urethritis, or the introduction of a syringe nozzle which has been previously used in an infected vagina, may both be the means of lighting up an acute purulent inflammation of the rectum.

PATHOLOGY.—The mucosa is highly congested, and bathed in a profuse purulent or muco-purulent discharge. The destructive action of the specific coccus on the epithelial cells of the rectal mucosa is very marked, and results in the production of limited or extensive areas of ulceration. If the gland-ducts are deprived of their epithelial lining, occlusion is likely to take place and retention cysts form. The infection may spread to the deeper structures about the rectum and produce a periproctitis and an ischio-rectal abscess. Where large patches of epithelium are destroyed, contraction takes place and stricture ensues.

SYMPTOMS. — The symptoms of gonorrheal proctitis are pain, tenesmus, and a burning or smarting sensation in the rectum. Accompanying these is a profuse purulent or muco-purulent discharge.

DIAGNOSIS.—If the surgeon is in doubt as to the character of the disease the microscope will, if it be gonorrheal, divulge the presence of the gonococcus of Neisser.

TREATMENT.—The diet should be regulated and the bowels kept open with saline purgatives. Rectal injections of cool, sterilized water are soothing to the inflamed mucous membrane and should be given frequently. Strong solutions of boric acid are highly recommended in this form of proctitis. In selected cases solutions of sulphate of zinc, gr. v to the ounce, or nitrate of silver, gr. ss to the ounce, are most serviceable. If these are used the rectum should afterward be flushed with water. The injections should be kept up until the specific coccus can no longer be detected.

PERIPROCTITIS.

Inflammation of the connective tissue about the rectum is termed periproctitis. It is produced by septic infection, and may arise from accidental or surgical wounds of the rectum or adjacent structures. It may also result from bicycling, horseback-riding, impacted feces, rectal neoplasms, pelvic inflammation, etc. The colon bacillus is looked upon by some as being the important factor in the production of this disease. This view is substantiated by the fact that abscesses forming in this region contain great numbers of the bacillus.

Symptoms.—Periproctitis is usually accompanied by constipation, increase of temperature, accelerated pulse, digestive disturbance, and more or less pain.

Treatment.—Rest in bed and cold applications to the parts may, in the early stage of the disease, prevent suppuration. If there are indications of pus formation, operative interference is demanded.

Abscesses arising from perirectal inflammation may appear at the anus, in the ischio-rectal fossa, or in the region of the insertion of the levator ani. Where the inflammation is confined to the tissues around the anus, the parts are kept constantly moist and somewhat macerated by the foul discharge, and in severe cases may assume the appearance of raw beef. Anal fissures and superficial fistulæ are of frequent occurrence from this affection.

CHAPTER XLIX.

DISEASES OF THE RECTUM (Continued).

ISCHIO-RECTAL ABSCESS.

THIS condition may be acute or chronic. The acute form may arise from traumatism, exposure to cold, penetration of the rectal mucosa by foreign bodies within the bowel, or from abrasions of the inner coat of the rectum, the result of hardened feces. As the rectal veins are but feebly supported in this region, the erect position favors stagnation in these vessels, with accompanying dilatation and attenuation of their walls. If in connection with these factors pyogenic organisms escape through an abrasion in the bowel-wall and attack the tissues in these parts, which have but little vitality, the conditions are such as to favor the formation of abscesses. The chronic form is often traced to tuberculosis, ulceration, stricture, or malignant growth of the rectum. Those of a broken-down constitution are usually affected.

Symptoms.—The formation of the abscess generally gives rise to a chill; the pulse is accelerated and the digestive organs are disturbed; the pain in the perineum is intense and of a throbbing character. Sitting is almost unbearable. There is also fullness in the rectum and constant tenesmus. Examination reveals a tumefaction, with or without fluctuation, in the region of the anus. A digital exploration of the rectum will often detect a protrusion of the rectal wall in the locality of the abscess. In some cases the inflammation will assume a more serious type, and set up a gangrenous cellulitis which may prove fatal. In the chronic form the swelling may completely fill the ischio-rectal space and extend up the rectal wall. There is usually an absence of pain. On palpation more or less fluctuation will be perceived. The tumefaction may continue for weeks or months and then break, leaving a large, ragged opening with undermined edges which will eventually result in a fistula.

Treatment.—An abscess in the ischio-rectal region should receive early attention to prevent the formation of a fistula. If it is superficial and not large, the finger should be introduced into the rectum to steady the parts while a free incision is made over the site of the

swelling from the anus outward. True ischio-rectal abscesses must be anticipated. The surgeon is not justified in waiting for fluctuation, but should act promptly so soon as tumefaction is discovered. The patient should be anesthetized and placed in a lithotomy position; a curved incision of sufficient length is made just external to the sphincter muscle; the structures are carefully divided until the abscess-cavity is reached, which should be freely opened, and all pockets broken up and thoroughly curetted. The cavity is then flushed with a bichlorid solution, swabbed with carbolic acid, and packed with sterilized gauze. The after-treatment consists in irrigating and repacking the cavity as often as is required, allowing the wound to heal from the bottom. The patient should be kept in bed and after a few days the bowels opened with a mild laxative.

Inflammation in the region of the levator ani may result from childbirth, septic infection of the uterus, or inflammation of the bowel. It may be acute or chronic. If acute, the temperature will be high, the patient will complain of rigors, and suppuration occurs. These abscesses may open into the vagina or bladder, and occasionally break into the peritoneal cavity with fatal results. In the chronic form the structures are agglutinated to each other by bands of cicatricial tissue, and, if the rectum is involved, stricture is liable to ensue.

FISSURE AND IRRITABLE ULCER.

These affections are quite common and occur more frequently in women than in men. They may result from various causes, such as constipation, diarrheal or dysenteric discharges, external injuries, morbid growths, or surgical operations for hemorrhoids, fistula, and other local troubles.

Symptoms.—An irritable ulcer, although insignificant in size, may give rise to intense pain and many reflex disturbances. In fact, cases are on record where patients afflicted with this disease have been driven to self-destruction by the mental worry and bodily discomfort attending it. The pain, which is paroxysmal, may be acute, burning, and tearing in character, and accompanies and follows defecation. It does not confine itself to the rectum, but may extend to the perineum, coccyx, spine, or lower extremities. Bleeding is another symptom which may or may not occur. In some cases the hemorrhage is profuse, but ordinarily it is slight, the feces being streaked with blood and mucus. Owing to the severe pain attending defecation, many patients defer going to stool so long as possible.

The accumulation of feces in the intestinal tract often produces flatulence, which is a very common accompaniment of this disease.

Examination.—A rectal examination should be preceded by a mild laxative and an enema. After the bowels are thoroughly emptied the patient may be examined. With a good light and the patient in the proper position, the surgeon should first inspect the external parts. Frequently there is present just external to the sphincter a cutaneous pile, sometimes called the sentinel pile, in the folds of which may be found a fissure. If no fissure is perceived externally, an internal examination should be made. This may be facilitated by the use of the speculum. Where the parts are very sensitive the examination should be conducted under nirvanin, cocaine, or general anesthesia. The speculum should be well lubricated and gently inserted into the rectum, care being taken not to allow it to encroach upon that part of the bowel where the patient experiences the most pain. By careful inspection of the mucosa, with a probe if need be, a fissure, if present, will usually be found just inside the external sphincter, lying between the rugæ of the mucous membrane and presenting a grayish or reddish appearance.

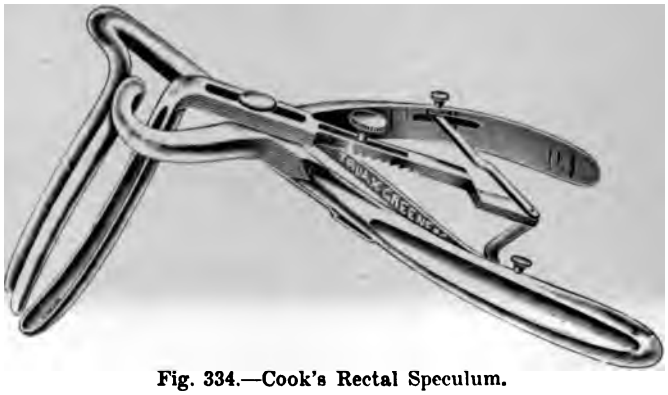


Fig. 334.—Cook's Rectal Speculum.

The use of the probe will demonstrate one or more extremely painful spots at the site of the lesion. Usually there is but one fissure located upon the posterior wall, although several may be present around the anal margin. An irritable ulcer is usually situated at a higher level than a fissure, and is also found more frequently on the posterior wall. Most of these ulcers are small in size, but in some cases they may assume large proportions. In outline they are oval, with more or less induration about their edges.

Prognosis.—Much depends upon the cause; if this can be discovered and removed the patient will get well. If the disease be neglected it may lead to serious nervous disturbance and general incapacity.

Treatment.—This may be palliative or operative. The diet should be regulated, all condiments and stimulants avoided, and the bowels kept soluble by mild laxatives and enemas. If the fissure is of recent origin and not the result of morbid growths in the rectum, palliative treatment will usually suffice. The parts should be kept well cleansed with some antiseptic wash, such as bichlorid of mercury or dioxid of hydrogen, and an application of an 8-per-cent. solution of nitrate of silver made direct to the fissure. To relieve the pain, especially during defecation, cocaine or orthoform may be used just preceding the act, and between-times the following ointment will be found useful:—

℞ Hydrargyri chloridi mitis . . . . . gr. iv.
Pulvis opii,
Extracti belladonnæ . . . . . ãã gr. ij.
Unguenti simplicis . . . . . 3j.

M. Sig.: Spread on lint and introduce into the anus. (Allingham.)

The use of ichthyol has also been highly extolled in the treatment of anal fissures. It is applied to the parts with a camel's-hair brush. If the disease does not respond within a fortnight, radical measures should be adopted. These comprise dilatation of the sphincter and cauterization, division, and excision of the fissure or ulcer.

Dilatation of the sphincter should be accomplished by means of the fingers under general anesthesia. Plenty of time should be taken to divulse the parts and care exercised not to injure the mucous membrane.

Cauterization may be performed by applying carbolic or nitric acid or the thermocautery. If the cautery is used it should be applied at a cherry red heat.

In division it is not always necessary to sever the sphincter; it will usually suffice to incise the mucous membrane together with a few of the muscle-fibers. (Copeland.)

To excise an ulcer or a fissure an elliptical incision is made extending through the mucosa; the diseased part is then removed and the edges of the mucous membrane brought together with catgut sutures.

FISTULA.

Fistula of the anus and rectum is a very common disease, and aside from fissures and hemorrhoids occurs more frequently than any other rectal trouble. It is not limited to any age, but generally appears during middle life. It is not so prevalent in women as in men.

Etiology.—It usually results from an ischio-rectal abscess, though injuries, necrosed bone, thread-worms, and inflamed hemorrhoids may also be exciting causes. The varieties usually described are: (1) a complete fistula, (2) a blind internal fistula, (3) a blind external fistula, and (4) a horseshoe fistula. A complete fistula is one with two openings: one upon the skin in the region of the anus, and the other connecting with the lumen of the bowel. A blind internal fistula is a suppurating sinus communicating with the bowel, but having no external aperture. A blind external fistula is one opening upon the skin, but having no connection with the rectum. A horseshoe fistula is one partially encircling the rectum, with one or more openings into the bowel and upon the skin surface.

Symptoms.—The symptoms of anal fistula are variable. There is usually in the beginning of the trouble considerable soreness in the vicinity of the anus. The pain increases to such an extent that at times the suffering is intense, and a swelling appears which eventually breaks and discharges pus. When a fistula has once formed but little pain or discomfort is noticed in the blind external variety, and, aside from an intermittent discharge of a small quantity of pus, the symptoms are *nil*. In the blind internal fistula the orifice may, at times, be partially blocked with fecal matter and result in an accumulation of pus, which is expelled from the anus during defecation. A complete fistula may be attended with painful defecation, itching, and moisture about the anus.

Examination.—Aside from the blind internal and horseshoe fistulæ, but little difficulty need be experienced in the diagnosis. Before making an examination the rectum should be emptied with an enema. The patient is placed in a Sims or lithotomy position and an external inspection first made. The external opening of a fistula, if one exists, will usually be found surrounded by granulation tissue or at the bottom of a slight depression in the vicinity of the anus. If no opening is found, an internal examination should be made, first with the finger and then with the anoscope. The finger, after being well lubricated, is introduced into the rectum and a careful palpation made of the rectal walls. If a blind internal fistula is present, the

finger may detect a cord-like induration, which usually marks its course and which may be followed up to its internal opening. If the aperture cannot be found by digital exploration, the anoscope should be inserted. After placing this in position and focusing reflected light upon the rectal wall, the internal opening, situated in the center of a teat-like projection, may be discovered with a probe. In the complete form, where the fistulous tract is so tortuous as to prevent the probe traversing it, an injection of milk or peroxid of hydrogen will usually force its way through the canal and mark the site of the internal aperture. In blind external fistula the probe will pass in as far as the rectal mucosa and then stop. In the horseshoe variety the openings may be so numerous as to allow the probe to traverse sinuses leading in many directions.

Treatment.—Before operating on these cases the bowels should be thoroughly cleaned out with laxatives and rectal injections.

Complete Fistula.—The patient is anesthetized and placed in a lithotomy position. If infiltration anesthesia is preferred, a solution of eucaine, cocaine, or nirvanin may be injected. A slender, silver

Fig. 335.—Plain Silver Probe.

probe is introduced along the fistulous tract and pushed through the internal opening into the rectum. With this as a guide a grooved director is slid along it and the probe withdrawn. The overlying structures are now divided upon the director with a long, sharp-bladed knife and the fistulous tract brought into view. (Fig. 336.) The curette is then thoroughly applied to the diseased tissue and gauze packing introduced. The parts are covered with sterilized dressings, which are retained with a T-bandage. The after-treatment consists in keeping the wound cleansed with an antiseptic solution and repacking with gauze when necessary. The packing should not be put in too firmly, and the amount should be lessened at each dressing, allowing the wound to heal from the bottom. The patient should be kept in bed and the diet restricted to soups, beef-broth, and soft-boiled eggs until the parts are healed.

Blind External Fistula.—This should first be converted into a complete fistula by making an internal opening into the bowel with the probe or guide, and then dealing with it in the same manner as in the complete variety.

Blind Internal Fistula.—The best plan to pursue in this form is to introduce the bent end of a probe into the internal opening and, with traction on its shank in a downward direction, bring the tip of the bent part in contact with the external tissues so that it can be felt. An incision made at this point converts the fistula into a complete one, which is to be treated as above described.

Horseshoe Fistula.—In this variety numerous sinuses may communicate with one another and the principal tract. In operating on these cases care must be taken not to sever the sphincter muscle more than once, lest incontinence should result. To obviate this all of the

Fig. 336.—Dividing Structures Overlying Fistulous Tract.

secondary sinuses should first be opened up, without interfering with the sphincter, and these connected with the principal one, which should be severed at a right angle to the muscle.

Ligation.—This method of treating fistula may be selected in cases where the patient refuses the knife, and in those who are exsanguinated or suffering from tuberculosis. It consists in passing a strong silk or rubber ligature through the fistulous tract and out of the anus, where both ends are tied sufficiently tight to cause constriction of the intervening tissues. In a few days it cuts its way out.

TUBERCULOSIS OF THE RECTUM.

Tuberculosis of the rectum may be primary or secondary, and occurs at all ages. The primary form usually appears in the young, while the secondary affects the adult. The tubercle bacilli may be conveyed to the parts through the food (?), the circulation, or the swallowing of sputum arising from a tuberculous lung. Rectal tuberculosis may reveal itself in the form of an ulceration, a fistula, or, rarely, as a stricture of the gut.

Ulceration.—This may exist as a simple ulcer or as a true tubercular ulcer. The former, while due to ordinary causes, does not respond readily to treatment, owing to the debilitated state of the patient brought about by the pulmonary lesion. The latter, the result of degenerative changes in the tuberculous nodules, has a tendency to spread along the intestinal tract, and shows no disposition to heal. These ulcers are irregular in shape, with undermined edges and surrounded by an indurated mucosa. If they are confined to the anal region the prognosis is fairly good, provided extreme measures are adopted; but if disseminated along the bowel little can be done aside from palliative treatment.

Stricture.—Tuberculous ulcers possess a tendency to spread, leaving in their wake ragged and devitalized tissues incapable of healing. In consequence thereof tuberculous stricture is exceedingly rare, because of the lack of cicatrization of the ulcerated areas.

Fistula.—A fistula usually results whenever the ulcer penetrates the bowel-wall and invades the deeper structures. It may open into the perineum, vagina, or peritoneal cavity. Owing to the broken-down condition of the patient, tuberculous fistulæ are not inclined to heal, and respond slowly, if at all, to treatment.

Symptoms.—Those afflicted with tuberculous affections of the lower bowel present the usual characteristic symptoms of tubercular lesions elsewhere, viz.: emaciation, cough, night-sweats, hemorrhages, and other manifestations of the disease.

Diagnosis.—An examination of the rectum will usually reveal a pale and attenuated mucous membrane, with ulcerated areas giving rise to a considerable discharge resembling in appearance dish-water. Tubercular fistulæ may be present; if so, they are distinguished from the common variety by their external and internal openings being larger, ragged, and patulous; less sensitive, and not inclined to bleed on contact with the probe. Their edges are undermined, and

tend to fall into the opening, while the surrounding integument is wanting in vitality, and presents a bluish appearance.

Prognosis.—The treatment of tubercular ulceration of the rectum is not satisfactory so far as a cure is concerned, since the great majority of these patients are primarily affected with pulmonary lesions, from which they sooner or later succumb. The duration of the disease may vary anywhere from five months to two and a half years.

Treatment.—The treatment consists principally in building up the subjects with nutritious food, fresh air, sunlight, moderate exercise, and cheerful surroundings. Tissue-builders, such as codliver-oil, extract of malt, creosote, and iron preparations may be prescribed; also intestinal antiseptics, such as mercuric bichlorid or sulphocarbolate of zinc.

For local treatment the anoscope may be introduced and the ulcers sprayed with an antiseptic solution, after which the parts should be well dried and iodoform powder applied. These measures are seldom curative, but often relieve the condition. Where the ulceration is prone to extend, some writers recommend more radical methods, such as the application of nitric acid, curettage, and burning of the parts with the thermocautery.

Tuberculous fistulæ and strictures are usually dealt with in the same manner as those of the non-tubercular type.

CHANCROID OF THE RECTUM.

Chancroid, or what is sometimes called soft chancre, is a contagious sore usually of venereal origin. Local in character, it is never followed by constitutional symptoms. It occurs frequently at the anal margin in women, and often the patient remains in total ignorance of its presence until ulceration takes place. The chancroid has no incubative stage, and, in appearance, is characteristic. It may be round, oval, or irregular in outline, with abruptly cut or undermined borders. The surface of the ulcer is uneven and covered with a grayish coating, giving off a thin, purulent secretion, which is quite irritating, and prone to inoculate the skin and mucous membrane in the vicinity of the sore. Pain is usually associated with an ulcerated chancroid, especially in the phagedenic form. The characteristic circumscribed induration at the base of a chancre is not present in chancroid. Phagedena may attack the soft as well as the hard ulcer, and may be gangrenous or serpiginous in character. In the former the ulcer becomes gangrenous and quickly sloughs; the tissues be-

come swollen, extremely painful, and assume a dark hue. In the latter it makes for itself a tortuous path through the tissues, often resulting in great destruction. These conditions are generally accompanied by constitutional disturbance.

Treatment.—Chancroids should be cleansed with a solution of bichlorid of mercury, 1 to 500 parts, and then dusted with aristol, iodoform, or orthoform. Applications of nitrate of silver, 60 grains to the ounce of water, or cauterization of the ulcers with carbolic or nitric acid, may be employed. In the phagedenic variety the galvanocautery or thermocautery should be used.

SYPHILIS OF THE RECTUM.

Syphilis of the rectum may be congenital or acquired. It may occur at any stage of the infection and manifests as a chancre, mucous patch, condyloma, or gumma. Women are more frequently affected than men. The rectum may be inoculated by syphilitic secretions from the vagina, by a chancre on the male organ coming in contact with the anus, or by the use of an infected syringe.

The congenital variety seldom persists beyond childhood.

Chancre.—Chancre of the rectum is not of frequent occurrence. It is generally characterized by the formation of a solitary ulcer, usually painless, which is elongated in outline, with an elevated border, a depressed center, and an indurated base. The discharge is scanty, tenacious, and watery. One of the peculiar features of a true chancre is its induration. If the ulcer is caught between the thumb and finger it will be found to have a hard base as well as an indurated border, both well marked and somewhat larger in circumference than the sore itself. Sometimes a chronic fissure may bear close resemblance to a hard chancre. If the surgeon is in doubt, a diagnosis should be deferred until the cutaneous eruption has had time to appear.

Mucous Patches.—These form during the secondary stage of the disease, and are prone to appear at the anal margin. Lack of cleanliness on the part of the patient favors their development; hence they are of frequent occurrence in dirty prostitutes. The appearance of these patches depends upon their location. Those found upon the skin differ from those upon the mucous membrane. Mucous patches occurring around the anus may be single or multiple, round or oval in contour, of a reddish or grayish color, and somewhat elevated. They are kept moist by a dirty, foul secretion, which macerates the

surrounding tissues. When these patches form one upon another, they receive the name of condylomata. Mucous patches frequently ulcerate. This may be brought about by the patches rubbing against the clothes or adjacent portions of the body, resulting in abrasion. These ulcers appear red and superficial, and may sometimes be mistaken for anal fissures.

Condylomata.—Women are more frequently affected with these growths than men. They may attain a very large size, their extent, duration, and proportions depending upon the amount of irritation to which they are subjected. They are round or oval in shape, somewhat flattened from pressure, of a warty or mammillated appearance, and more or less elevated above the surrounding integument. They readily ulcerate, and throw off a muco-purulent secretion. This secretion is infective, and spreads the disease over the adjacent surfaces.

Gummata.—These growths are prone to develop during the tertiary stage of syphilis. There may be one or more present, which usually vary from one-half to three-fourths of an inch in diameter. When found in the rectal wall they impart to the touch the sensation of round, flat, hardened nodules. After attaining a certain size they readily disintegrate in the center and slough out. In other cases they ulcerate slowly and undermine the adjacent structures. The destruction of tissue usually results in stricture of the rectum.

Treatment.—Syphilitic affections of the anus and rectum require local and constitutional treatment. As soon as the initial lesion is manifested local applications may be used, but internal medication should be deferred until the characteristic eruption makes its appearance.

Chancre.—The chancre requires frequent cleansing with some mild antiseptic solution. Peroxid of hydrogen, 1 part to 6 parts of water, or a solution of bichlorid of mercury, 1 to 1000 or 2000 parts, may be used. Increase in the size, with ulceration of the chancre, requires more radical treatment. This consists in cauterizing the sore with pure carbolic or nitric acid. The cauterized surface should then be dusted with powdered iodoform, aristol, or calomel. Some operators prefer the thermocautery in these cases.

Mucous Patches.—As these are prone to multiply, owing to the infective character of the secretions, it becomes necessary to keep the parts thoroughly cleansed with an antiseptic wash and also well dried. A solution of carbolic acid, 1 to 20 parts, or bichlorid of mercury, 1 to 500 parts, should be used, and after drying the surface

apply powdered calomel or iodoform. The patches should be protected from friction by one or more layers of absorbent cotton. Good results may be obtained in many of these cases by the application of carbolic acid or the thermocautery.

Condylomata.—These excrescences demand radical treatment. They should be ablated with knife or scissors and their bases cauterized with nitric acid or the thermocautery.

Gummata.—If of recent occurrence, internal medication in the form of the iodids, together with rectal massage, will often hasten their absorption and at the same time prevent the appearance of new growths. Enormous doses of iodid of potassium are required. By commencing with 20-grain doses three times daily, the quantity must be rapidly increased until the patient is taking from 6 to 8 drachms of the drug in the twenty-four hours. It should be given in milk or water, of which the patient should drink copiously. Hot baths should be frequently taken and the bowels kept open.

STRICTURE OF THE RECTUM.

Stricture of the rectum is a diminution in the lumen of the gut. It is generally confined to middle age. Women are more subject to it than men. The stricture may be complete or incomplete. In complete stricture no fecal matter can escape. In the incomplete form the impediment to the passage will be proportional to the degree of constriction.

Etiology.—Stricture of the rectum may be due to traumatism, extrarectal growths, retroverted uterus, hypertrophied prostate, bands of adhesions, pressure of the child's head during labor, and ulcerations resulting from syphilitic, tubercular, or malignant diseases. Traumatic stricture may arise from constipation, foreign bodies lodged in the rectum, or operations for fistula, hemorrhoids, or fissure. In strictures resulting from external causes—such as tumors, hypertrophied prostate, or retroverted uterus—the mucous membrane of the bowel is usually found in its normal condition. Syphilitic stricture is of frequent occurrence, and may be due to a deposit of gummatous nodules or ulceration of the rectal wall. Tubercular stricture is exceedingly rare, owing to the lack of cicatrization of the ulcerated areas. These ulcers are prone to spread, and possess but little healing power. While many writers mention dysentery as a common cause of stricture in the tropics, statistics show that it is of extremely rare occurrence. Malignant stricture is comparatively frequent, and re-

sults from contraction of the rectal walls or cancerous nodules invading the lumen of the gut.

Symptoms.—Stricture of the rectum usually produces both local and constitutional disturbances. The commencement of the trouble is generally marked by constipation alternating with diarrhea. As the disease progresses, there will be constant straining, tenesmus, and pain, radiating up the spine and down the limbs. If the stricture is low down in the rectum, the stools voided have a peculiar formation, assuming a tape, or ribbon-like, form; but, if the disease is high up, they may have the natural contour. Tape, or ribbon-like, stools are not pathognomonic of stricture, as such may occur from spasm of the sphincter muscle, resulting from fissure or irritable ulcer. When the stricture is located well up in the bowel, soluble feces may pass through the constriction and, accumulating in the lower chambers of the rectum, be expelled in their natural form. The constant irritation of the mucous membrane resulting from the lodgment of fecal matter above the contracted gut produces purulent and bloody discharges, indigestion, and tympanites.

Fig. 337.—Wales's Soft Rectal Bougie.

Examination.—Whenever a sufficient number of the above symptoms present, the surgeon should ever consider the probabilities of a stricture of the rectum, and substantiate any provisional diagnosis by a rectal examination. The patient should be placed in a Sims or knee-chest posture for a digital exploration. If the stricture is within three inches of the anus, it can easily be reached with the finger and its character ascertained. If located high up in the rectum, the surgeon may have to resort to the use of the rectal bougie, or perform an abdominal section before a positive diagnosis can be made. Occasionally a bougie on being introduced into the rectum will impinge upon the promontory of the sacrum or catch in one of the rectal valves and give the impression of a stricture. In other instances it may double upon itself when the stricture is encountered, and lead the surgeon to believe that no obstruction exists. (Gant.) Dilatation of the rectum invariably ensues above the stricture, while diminution in its caliber results below.

Prognosis.—The prognosis, so far as a cure is concerned, is by no means flattering. Many of these cases can be relieved and in a few

instances cured, but the majority will succumb sooner or later to the disease or its complications.

Treatment.—This is palliative and operative. Palliative treatment consists in restricting the diet, softening the feces, assuaging pain, and keeping the stricture patent. The diet should comprise such articles of food as milk, soups, and soft-boiled eggs. The bowels should be kept soluble with mild laxatives and rectal injections. For the relief of pain hot fomentations or turpentine stupes may be applied over the abdominal and perineal regions; or, if necessary, opiates should be given. In syphilitic stricture, where the obstruction depends upon recent gummatous deposits, the absorption of these may be hastened by the administration of mercurials and iodid of potassium. The general condition of the patient should be improved by tonics, pure air, and plenty of sunlight.

Operative Treatment.—This comprises the following methods: (1) dilatation; (2) internal proctotomy; (3) external, or posterior, proctotomy; (4) excision; (5) colostomy.

Fig. 338.—Conical Rectal Bougie.

Dilatation.—This method is feasible when the stricture is not located too high up in the rectum. It may be performed with the fingers or rectal bougies. In divulsing a stricture no force must be used, but gradual and gentle efforts should be employed to overcome the obstruction. Gradual dilatation will in many cases increase the lumen of the constricted portion of the bowel to such an extent as to give great relief; but, unless patency of the affected part is maintained by passing the bougie at regular intervals, a recurrence usually results. In the earlier course of the treatment the bougie should be introduced at least twice a week. Strictures of three and one-half inches or more should not be dilated, owing to the great danger of rupture of the bowel-wall.

Internal Proctotomy.—This operation consists in making superficial cuts at different points through the strictured portion. It is accomplished by anesthetizing the patient, introducing the index finger through the contracted orifice, and guiding a blunt-pointed bistoury along its palmar surface into and through the stricture. By slight pressure upon the back of the knife the indurated tissue is nicked

in as many places as is deemed necessary. The operation must be followed up by the use of the rectal bougie. The objections to this method are: (1) the danger of fecal extravasation into the perirectal tissues; (2) difficulty at times in controlling hemorrhage.

External Proctotomy.—This method gives better results with less danger to the patient than internal proctotomy. Previous to operating, the rectum should be emptied by injections and the parts sterilized. General anesthesia is used and the patient placed in a lithotomy position. A long, straight-bladed knife is entered above the obstruction, and a free incision made in the posterior median line of the bowel, extending backward to the hollow of the sacrum and including the stricture, bowel, and anal tissues. In making this incision care should be taken to have the broadest portion of the cut at the most dependent part to prevent fecal accumulation. The wound is cleansed with a solution of bichlorid of mercury, 1 to 4000 parts, and packed with sterilized gauze, over which are placed sterilized dressings retained with a T-bandage. The parts should be washed out daily with an antiseptic solution and repacked with gauze. To prevent too

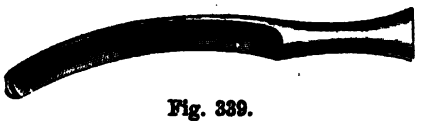


Fig. 339.

much contraction during the process of healing, the rectal bougie should be inserted every few days. The benefits derived from this operation are: (1) it allows of free drainage, (2) hemorrhage can easily be controlled, and (3) but little difficulty is experienced in keeping the wound cleansed.

Excision and Colostomy.—These operations are described under "Cancer of the Rectum."

J. B. Bacon has devised a novel method for the treatment of stricture above the internal sphincter muscle. He states that in external proctotomy the incision leaves a triangular wound which fills with fibrous tissue and produces a recurrence of the stricture. If this can be prevented the severed band of strictured tissue will disappear by absorption. He therefore establishes a mucous fistula between the stricture and the coccyx, so that the mucous tract will be at the bottom of the wound and prevent the divided bands from uniting. The patient is anesthetized, and an aneurism needle threaded with heavy silk ligature is passed through the posterior wall of the bowel in the median line just above the internal sphinc-

ter; it is then carried backward into the perirectal tissue close to the coccyx and upward behind and beyond the stricture into the lumen of the gut. One end of the ligature is caught and drawn out of the anus and the needle removed. The two ends are now tied and the seton left in place for about three months to establish the fistula. When this has developed the ligature is withdrawn, a grooved director passed through the fistulous tract, and the overlying structures, including the stricture, severed with a Paquelin cautery. It is very essential in passing the seton to embrace plenty of tissue above and below the stricture, lest failure ensue.

CHAPTER L.

DISEASES OF THE RECTUM (Concluded).

HEMORRHOIDS.

THE veins which are distributed to the lower portion of the rectum constitute the anal and rectal plexuses. Such vessels are prone to become distended and form small tumors known as piles, or hemorrhoids. These may appear below or above the external sphincter muscle, and are called, respectively, external and internal hemorrhoids. Piles are of frequent occurrence, and commonly observed in both sexes during middle life, but are rarely seen in children.

Etiology.—Whatever interferes with the return-flow of blood in the venous circulation conduces to the formation of these tumors. Hence obstructive diseases of the heart or liver, abdominal tumors, pregnancy, constipation, urethral stricture, vesical calculus, retroverted uterus, or enlarged prostate may be exciting causes. Furthermore harsh purgatives, irregular habits, and certain occupations—such as those of conductors, brakemen, shop-girls, and others who are compelled to be on their feet constantly—are frequent factors in the production of this disease.

External Hemorrhoids.—These piles are covered with integument, and form around the anal margin just below the external sphincter. They are divided into two varieties, viz.: cutaneous and thrombotic. The cutaneous pile is composed of hypertrophied skin and connective tissue; the thrombotic form results from a clot plugging the lumen of a vein, which produces a small, tender, bluish tumor.

SYMPTOMS.—In the quiescent state piles do not cause much disturbance. There may be some irritation and a sense of fullness, and, at times, especially during stool, a slight tenesmus. If they become inflamed, the pain may be intense and of a throbbing character, and the tenesmus constant; the pulse becomes accelerated and the temperature elevated.

TREATMENT.—This is both palliative and operative.

Palliative Treatment.—The patient should be kept at rest as much as possible, the diet restricted to bland food, and the bowels

regulated by the administration of saline laxatives. If the parts are much inflamed, soothing lotions, ice-bags, or hot fomentations should be applied. The following local application is most satisfactory as a routine treatment:—

℞ Ointment of tannic acid,
" " belladonna,
" " stramonium . . . . . āā ʒij.

M. Sig.: Apply to the parts frequently. (Kelsey.)

Samway treats external piles by the application of collodion. It is applied on a little cotton-wool each morning after defecation. He claims that it causes the pile to contract and supports it as an elastic stocking does varicosed veins of the leg.

Operative Treatment.—Before removing hemorrhoids divulsion of the external sphincter should be performed, under nirvanin or

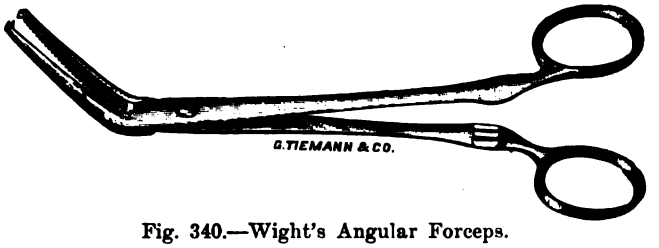


Fig. 340.—Wight's Angular Forceps.

eucaine anesthesia, in order to prevent painful contraction of that muscle following the operation. In the cutaneous variety the apex of the tumor is grasped with a pair of compression forceps, and the hypertrophied skin snipped off with scissors. To prevent too much contraction no more of the skin than is necessary should be excised at the base of the growth. If the edges gape much, they may be coapted with catgut. The thrombotic form should be dealt with by incising the wall of the vein, scooping out the clot, and cauterizing the edges of the wound with a thermocautery. Gauze packing is introduced and sterilized dressings applied.

Internal Hemorrhoids.—These growths may be either capillary or venous in character. The former spring from the superficial vessels, and barely extend into the lumen of the bowel. They are extremely vascular, and resemble strawberries. The latter result from dilatation of the veins beneath the mucous membrane of the rectum, and appear as soft, smooth tumors of a bluish color, which may become

so pedunculated as to protrude through the anal aperture. Occasionally a prolapsed pile will become constricted by the sphincter to such an extent that strangulation will ensue unless reduction soon takes place. In this way a cure will sometimes be brought about, though it is fraught with terrible suffering, and not devoid of danger.

SYMPTOMS. — In the capillary form hemorrhage is the most prominent symptom. This may be continuous or occur only during defecation. It may be slight or so profuse as to cause syncope. The pain in these cases is not usually marked, but the loss of blood may make great inroads upon the patient's health and strength. In the venous form the hemorrhage is not so continuous. At first there may be but a few drops accompanying defecation, later the bleeding may be increased, and occasionally severe hemorrhage takes place. If prolapse or inflammation occurs there may be tenesmus, throbbing pain, discharge of mucus, and constitutional disturbance.

TREATMENT.—Internal hemorrhoids may be treated by palliative or radical measures.

Palliative Treatment.—If the condition has not advanced too far, this method may not only give relief, but effect a cure. The diet should be as bland as possible, strong drinks interdicted, and the bowels opened daily with saline laxatives. To give tone to the mucous membrane of the rectum cold water or mild astringent solutions may be injected after each stool. Protruding piles, unless strangulated, should be reduced as soon as possible; if not large, an application of nitric acid to their bases will generally produce contraction. When palliative treatment fails to relieve or remove the hemorrhoids, radical methods should be employed. If the patient will submit to an operation at the beginning of the trouble much time and suffering may be saved.

Radical Treatment.—Many methods have been devised for the cure of internal hemorrhoids, but only a few will be considered. These are as follows: (1) injection, (2) ligation, (3) clamp and cautery, and (4) excision.

Injection.—This method was much used a few years ago, but has lately fallen into disrepute. Many bad effects have attended the injection of hemorrhoids in the way of abscesses, fistulæ, extensive sloughing, and general sepsis, although good results have been attained under aseptic conditions and careful discrimination in the selection of cases. Gant states that only small, distinct, pendulous piles situated above the grasp of the sphincter should be injected, and also cautions the surgeon not to inject hemorrhoids which are

inflamed, strangulated, ulcerated, or very large. The following prescription is used by him with satisfactory results:—

℞ Acidi carbolici . . . . . gr. xij.
Glycerini,
Aquæ . . . . . ää ʒij.
M. Sig.: Inject.

Before injecting a pile see that the rectum is empty, the anus and adjacent parts well washed with some antiseptic solution, and the syringe and needle thoroughly sterilized. Do not inject more than two hemorrhoids at one sitting. If the pile is small, from 2 to

Fig. 341.—Ligating Pile.

5 drops may be instilled; in larger growths from 10 to 15 drops. The injection should be made directly into the pendulous portion, and the needle left *in situ* until the pile becomes blanched in appearance. After the needle is withdrawn the pile should be covered with some lubricant and returned beyond the grasp of the sphincter. If the after-pain is severe, the patient should be put to bed, hot fomentations applied, and opiates administered.

Ligation.—This method, with some modifications, has been in use for centuries. To-day it is perhaps resorted to as often as any other method. In ordinary cases it is usually a safe and efficient way

of dealing with these growths. The preliminary preparations consist in emptying the bowels, cleansing the parts, and sterilizing the instruments. The patient is anesthetized and placed in the lithotomy position. With the fingers or rectal dilator the sphincter should be gradually divulsed until a good view of the parts is obtained. The pile is now grasped with a catch forceps and freed from its under and lateral attachments with a pair of scissors. This leaves it sus-

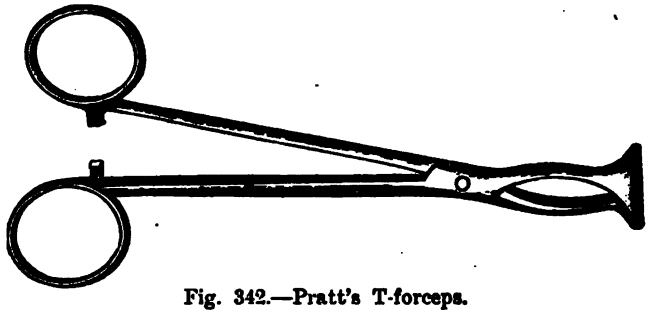


Fig. 342.—Pratt's T-forceps.

pended by a strip of mucous membrane on its upper surface, in which ramify the vessels that supply it. A strong silk or catgut ligature is thrown around the pedicle and tied tightly with three knots to prevent slipping. (Fig. 341.) If the pile is large, the portion projecting beyond the ligature is snipped off; if small, the strangulated part may be left to slough away. In cutting off a pile care should be taken not to excise too near the ligature for fear of the loop slipping,

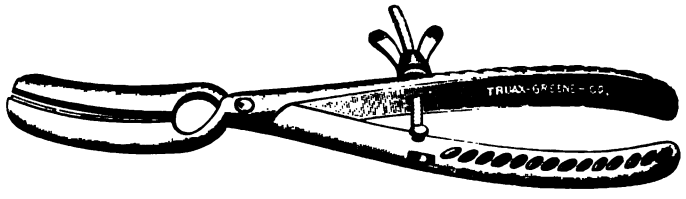


Fig. 343.—Kelsey's Hemorrhoidal Clamp.

in which case severe hemorrhage might result. If more than one pile exist, they should be dealt with in the same manner. The patient should be put to bed and remain there for at least a week.

If the after-pain is severe, an opium or orthoform suppository, if the patient will tolerate it, may be introduced into the rectum, and hot applications applied. The bowels should be confined for four or five days, and then opened with a mild laxative. The ligatures usually come away in a week.

Podrcze pursues the following method of treating hemorrhoids: He first dilates the sphincter and packs cotton-wool into the rectum above the piles. Each hemorrhoid is caught with forceps and the integument at the base is incised as close as possible to the mucous membrane; a needle threaded with silk is inserted into this wound and carried around the base of the pile till it emerges at the starting-point. This ligature is tied and cut, and the pile clipped off; the edges of the skin and mucous membrane are then brought together with catgut suture. Each pile is treated likewise. The cotton-wool is removed, a drainage tube covered with iodoform gauze introduced into the rectum, and sterilized dressings applied.

Clamp and Cautery. — This method has gained considerable prominence in the last few years. The surgeon should have a good clamp, pile forceps, and a thermocautery. Under nirvanin or eucaine anesthesia the sphincter is dilated and the pile caught with forceps and drawn outward; the clamp is then adjusted and firmly tightened

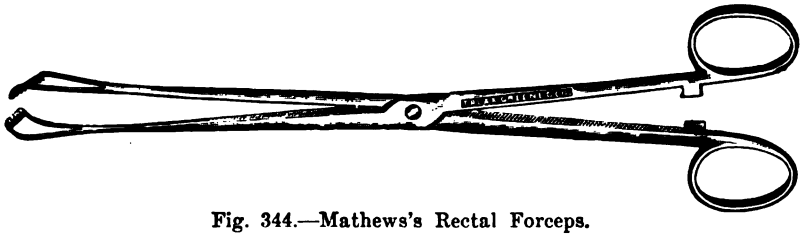


Fig. 344.—Mathews's Rectal Forceps.

so as to compress the base of the hemorrhoid. If the pile is large it is cut off with scissors and the stump well cauterized with the thermocautery at a cherry-red heat. (Fig. 345.) The clamp is then loosened, and if any oozing occurs the stump should again be cauterized. If more than one tumor is present, all should be treated in the same manner. Some operators, previous to applying the clamp, dissect the pile from the skin and mucous membrane and then adjust it tightly to the base of the hemorrhoid. By pursuing this course there is but little risk of cauterizing the skin. It is from such an accident that extreme pain arises. If the pile is small the clamp need not be used, the cautery being applied directly to the hemorrhoid. The after-treatment consists in rest in bed and keeping the parts clean. The bowels should be moved on the third or fourth day.

Excision.—This operation was devised by Whitehead, of Manchester, Eng. It is extremely radical, and is best adapted to those cases in which numerous hemorrhoids are present. The patient is

anesthetized, placed in a lithotomy position, and the sphincter well divulsed. An incision, with a pair of sharp-pointed scissors, is made clear around the anus just inside of the line formed by the skin and mucous membrane. The mucosa is quickly separated from the submucous tissue beyond the region of the piles and severed with a circular cut. As this last incision is being made the proximal end of the mucous membrane is caught with compression forceps and drawn down. All bleeding vessels are ligated and the mucous membrane stitched to the skin with silk.

Thomas C. Martin has perfected a new method for the removal of internal hemorrhoids under local anesthesia. He utilizes a specially devised clamp "consisting of a hollow cone three and one-fourth inches in length and three-fourths of an inch in diameter at its distal end, and one and three-fourths inches at its proximal extremity. One quadrant of the cone is fenestrated. This is occupied by a movable blade with a serrated edge, which makes contact with the cone's serrated edge. The movable blade is sheathed in the cone when the jaws of the clamp are separated. Hence, after the instrument is introduced it may be made to receive the pile without irregularly expanding the anus." The patient is placed in the Sims position and each pile located by means of the anoscope. A $^1/_{10}$-of-1-per-cent. solution of eucaine is injected into the summit of each hemorrhoid by means of a long, tapering needle. The anoscope is next withdrawn and the tumors grasped with curved forceps. The clamp is then lubricated and inserted into the anus with its blade forced against the pile which first is to be removed. The fenestrum is opened and the growth drawn into the lumen of the clamp. The instrument is now closed and locked and the hemorrhoid cut off. If the operator fears hemorrhage, either the cautery or catgut ligatures may be used on the stump. Each tumor is treated in the same manner. This method insures a dry, sterilized field to work in, and will materially aid the surgeon in the removal of these benign neoplasms.

POLYPOID GROWTHS OF THE RECTUM.

These are pedunculated tumors springing from the mucosa of the rectum. They are of common occurrence, and in the benign form usually appear in children. Polypi may be soft or hard in character,—respectively called adenoid and fibrous. The adenoid form is lobulated and of a reddish hue. It is usually attached to the

rectal mucosa by a narrow pedicle, and varies in size from that of a bean to that of a large plum. If the pedicle is very long the tumor may be expelled from the anus during stool and suffer strangulation. The fibrous variety is benign in character. It is generally pedunculated, and springs from the mucous membrane. In some instances it may assume a very large size.

Symptoms.—These consist of a mucous discharge, tenesmus, and a tendency to bear down. In the vascular type hemorrhage is of

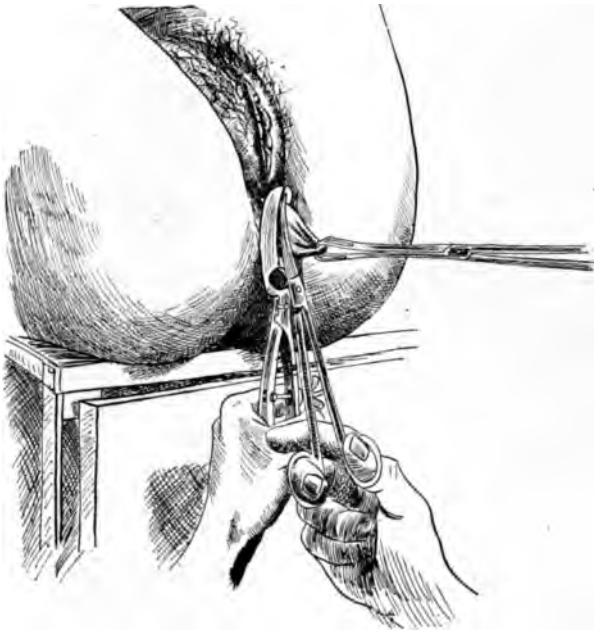


Fig. 345.—Clamping and Severing Pile.

frequent occurrence. If the growth becomes strangulated there may be considerable pain.

Diagnosis.—Proctoscopy will determine the presence, location, and character of the growth.

Treatment.—This will depend somewhat upon the location of the growth. If the polypus is low down in the rectum it may either be ligated and cut off or clamped with a good hemorrhoidal clamp and removed with scissors. In the latter method the stump should be well cauterized with the thermocautery. Where it is situated high up in the bowel the cold wire snare may be used to ablate the growth.

(Fig. 346.) Some operators seize the pedicle with a long-handled clamp forceps and allow the instrument to remain in place until the polypus sloughs off. Sessile tumors may be removed with the curette and their bases cauterized with nitric acid or the thermocautery. The after-treatment consists in rest in bed, and in case of severe pain the use of an opium or orthoform suppository.

PAPILLOMA.

Papillomatous growths are of frequent occurrence in the rectum, and in some instances may be disseminated throughout the entire rectal mucosa. They are also prone to appear upon the integument

Fig. 346.—Snaring off Polypoid Growth.

in the region of the anus. While generally very small, they may attain the size of a cherry or even larger.

Etiology.—These tumors may result from a gonorrheal, chancroidal, or syphilitic infection. In some instances no cause can be ascertained.

Symptoms.—If situated upon the mucous membrane of the rectum, they may give rise to hemorrhage, bearing-down efforts, and mucous discharge; if upon the integument, pain and soreness may be present.

Diagnosis.—Proctoscopy reveals the growth.

Treatment.—The growths should be snipped off with scissors and their bases cauterized with the thermocautery.

LIPOMA.

Lipomas, or fatty tumors, may appear in the region of the anus, and are similar in character to fatty growths occurring elsewhere. They are generally found in the tissues surrounding the rectum and subcutaneously at the margin of the anus.

Treatment.—This consists in making an incision down to the capsule, shelling out the growth, and bringing the edges of the wound together with catgut.

FIBROMA.

These tumors are hard, and present a smooth surface. They are extremely rare, and when found are usually situated about the anus and vulva and in the walls of the rectum. They are generally sessile and covered with mucous membrane.

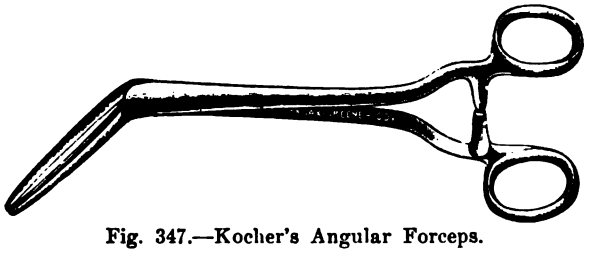


Fig. 347.—Kocher's Angular Forceps.

Treatment. — Incise the mucous membrane and remove the growth.

RETENTION CYSTS.

These tumors are occasionally found in the rectum and around the anus. Their contents may be of a sebaceous nature or of a curdy, whitish material. No special symptoms are present.

Treatment.—To effect a cure, complete removal of the cyst-wall is imperative, else a recurrence is almost sure to follow.

Teratomas (or dermoid cysts), angiomas, myomas, and enchondromas may occasionally be found in the anal region. The treatment for each consists in complete removal of the tumor.

CANCER OF THE RECTUM.

The rectum is more predisposed to cancer than other portions of the intestinal tract. It may occur in the young as well as in the aged, but usually manifests itself during middle life. According to statistics, men are more often affected than women.

"The histological structure of most of the rectal carcinomata presents a tubular arrangement of the cell, surrounded and inclosed by a connective stroma which, in the soft variety of tumors, is exceedingly scanty, and in the hard, constricting variety is very abundant and compact. In the rapidly infiltrating form the rectal tube becomes indurated and the surface ulcerates, but its lumen is not much reduced in size. In the circular constricting form the constricting ring is very dense and the lumen of the bowel is rapidly diminished in size." (Senn.)

The latter form produces obstruction, and is more amenable to surgical procedures than the other varieties.

Symptoms.—Cancer of the rectum may present various symptoms, and, while many are characteristic, none is truly pathognomonic. Diarrhea is usually the first symptom manifested; it frequently alternates with constipation at the beginning, but may become constant later on in the course of the disease. Pain is not generally present in the early period of the trouble, but toward the latter stages, and especially when obstruction ensues, it may be intense. If the disease attacks the lower portion of the rectum or involves the sphincter, there will be considerable tenesmus, and the pain will appear earlier than where the disease is located higher up. Bleeding may occur at any stage of the trouble, but does not tend to become profuse until extensive ulceration has taken place. Discharges of pus, blood, and mucus are of frequent occurrence; toward the last, large masses of necrotic tissue may be expelled. The discharge from a cancerous growth of the rectum has a peculiar and characteristic odor; one need only perceive it but once in order to associate it with malignancy. Obstruction is another symptom, but does not usually occur until the disease has made considerable advancement. (Fig. 348.) It may be partial or complete, and while it may result from the growth encroaching on the lumen of the bowel, it is generally due to the contraction of the rectal walls. If the obstruction is partial and is situated well down in the rectum, the feces may assume a ribbon-like form when expelled from the bowel. If the patient is suffering from complete obstruction she will die unless relief is soon obtained. The nutrition of cancerous patients, in general, is markedly impaired, and their complexion undergoes a decided change, assuming a cachectic appearance, although in some instances they may possess every indication of good health.

Diagnosis.—A digital examination should always precede the introduction of the proctoscope. If the growth or contracted portion of the bowel is not too high up, the finger will detect the presence

and location of the mass. No effort should be made to force the member through a constricted part, as rupture of the bowel-wall might occur; the same may be said of instrumental examination. Enlargement of the sacral glands, fixity of the rectal walls, together with nodular masses and cachectic condition of the patient, all point strongly to malignancy. If the examiner is in doubt as to the character of the growth, the digital examination may be confirmed by means of the proctoscope. Through it the surgeon may remove a sufficient amount of the growth for microscopic inspection. When the growth begins to break down, its appearance through the procto-

Fig. 348.—Malignant Stricture of the Rectum.

scope differs from what is felt by the finger. "When the mass once begins to degenerate, it not infrequently sloughs rapidly, and the proctoscopy made later in such cases reveals, instead of a contracted lumen due to the encroachment of the tumor, the rectum inflated and expanded to a normal degree, exposing a large, ulcerated area apparently of great depth because of the infiltration and edema of its borders. Let the physician now place such a patient in a dorsal position and make a digital examination, and, if the tumor be within reach, his finger will detect a mass which seems to his sense of touch not unlike the original growth. This fallacy is due to the collapse

of the rectum and prolapse and invagination of the indurated structures." (Martin.)

Treatment.—This depends upon the extent and location of the disease, also the age and condition of the patient. It resolves itself into palliative and operative.

PALLIATIVE.—Those who refuse an operation should be relieved of their pain by administering anodynes, such as morphine hypodermically or opium in the form of suppositories. The food should be as bland and nutritious as possible, the bowels kept soluble, and the patient made as comfortable as conditions will permit.

OPERATIVE.—Where the growth produces a diminution in the lumen of the bowel, internal proctotomy or external proctotomy may be employed as palliative measures. These operations are described under "Stricture of the Rectum."

Curettage.—This may be performed in inoperable cases to remove large fungoid masses extending into the lumen of the bowel, which give rise to obstruction, excessive hemorrhage, or much pain. After thorough removal with the curette, the thermocautery should be applied to the entire affected area.

Colostomy.—This operation must also be classed as a palliative one, and may be performed in either the lumbar or iliac region. The latter is preferable, owing to the location of the artificial anus, which allows the patient to care for herself in an easier and better manner. Some operators prefer making a colostomy prior to excising the bowel, claiming that the latter can be performed under more satisfactory conditions. In order to protect himself from future annoyance, the surgeon, before operating, should make the patient and her friends thoroughly understand the character of the operation and also the inconveniences accompanying an artificial anus.

The preliminary preparations are carried out in the same manner as in all abdominal operations. If the inguinal route is selected the patient is anesthetized and placed in the Trendelenburg position. An incision is made on the left side about one and one-half inches inside of Poupart's ligament, beginning at the anterior superior spine of the ilium and extending from one and one-half to two inches in a downward and inward direction. This divides the skin and adipose tissue. The aponeurosis of the external oblique is severed, and that muscle, together with the internal oblique, is separated with the fingers in the direction of their fibers. The properitoneal fat is next divided and the peritoneum brought into view, which is caught up and opened, exposing the abdominal cavity. One or two fingers should

now be introduced through the wound and search made for the large bowel; this, when found, should be brought out of the opening, and the loop of gut held in position with a smooth, sterilized rod passed through its mesentery. (Fig. 349.) If a temporary artificial anus is contemplated, no spur need be made; in which case the projecting loop of bowel is stitched to the edges of the abdominal wound with interrupted catgut sutures. These should pass only through the serous and muscular coats of the bowel and the muscular portion of the parietal wall. If obstruction constrains the surgeon to open the bowel at the time of the operation, a longitudinal incision should be made the required length, and the edges of the gut stitched to the skin with

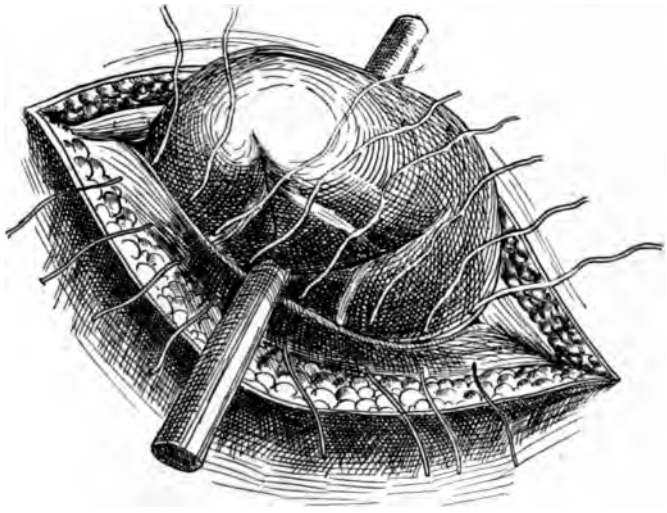


Fig. 349.—Sterilized Rod Passed through Mesentery.

fine silk; otherwise this should be postponed for several days to permit the parts to become agglutinated and wall off the peritoneal cavity. After the opening has answered its purpose, the rod is withdrawn and the bowel retracts, forming a fecal fistula, which may be repaired by a plastic operation. If a permanent artificial anus is intended, a good spur should be formed.

Allingham pursues the following method: A knuckle of bowel is drawn out of the abdominal incision and its mesentery found. A needle threaded with carbolized silk is passed through the skin on the outer edge of the wound, then through the mesentery behind the gut, back again through the mesentery, and emerging from the skin on

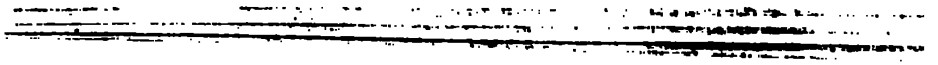
the same side it entered. This suture on being tied brings the peritoneal surfaces of the mesentery and the parietal wall together. The bowel is then fastened to the skin with silk sutures introduced at the upper and lower angles of the incision and on the side opposite to the mesenteric stitch, care being taken not to penetrate the mucosa of the bowel. If deemed necessary, more sutures should be inserted. Should there be no immediate necessity for opening the gut, the parts should be well protected with sterilized dressings and left for three or four days. The projecting knuckle of bowel should then be excised on a level with the skin. (Fig. 350.)

Fig. 350.—Inguinal Colostomy.

Excision.—This method is best adapted to cancerous growths limited to the four lower inches of the rectum and involving the posterior wall. Before operating see that the bowels are well emptied. The patient is anesthetized and placed in an exaggerated lithotomy posture. If the anal portion of the rectum is implicated, a circular incision is made a sufficient distance from the anal aperture to include all suspected diseased tissue, and joined by another incision extending from the posterior portion of the anus to the tip of the coccyx. The rectum is carefully dissected from the perirectal tissues up to

a point beyond the limits of the disease and completely divided with scissors. If the peritoneal cavity is entered it should be immediately closed, all bleeding vessels ligated, and the proximal end of the gut, if possible, drawn down and stitched to the skin. Should there be no involvement of the anal portion of the rectum, the surgeon should endeavor to preserve the sphincter. The wound should be covered with sterilized dressings and a T-bandage applied. The diet should be restricted to liquid food, and the bowels opened on the sixth or seventh day with salines. A colostomy pad and receptacle have been devised by Dr. Frederick C. Herrick, of Cleveland, Ohio, which not only collects the feces as they are extruded from the opening, but quite effectually controls the odor.

Kraske's Method.—This operation may be employed in cases where the carcinoma is located high up in the rectum. An incision is made beginning at the second sacral vertebra and extending to the anus. The left side of the sacrum is thoroughly exposed, and part of it, with the coccyx, excised. The incision is then carried around the anus, and the rectum separated from its attachments as high up as is necessary. During this stage of the operation the peritoneal cavity is opened and the bowel pulled down and severed by a transvere incision. The proximal end of the intestine is sutured to the tissues of the ischio-rectal space as low down as is possible. Drainage should be introduced, the cavity packed with sterilized gauze, and dressings applied.



INDEX OF REGIONAL SYMPTOMS.

ASCITES.

Ascites may indicate:—

Abdominal Tuberculosis .....frequently encysted.
Carcinoma Ovary .....common.
Ovarian Cyst .....occasionally—more common in papillomatous or malignant degeneration.
Papillary Parovarian Cyst .....common.
Sarcoma Ovary .....not so marked as in carcinoma.
Subperitoneal Fibroid .....occasionally.

DISCHARGE.

Urethral.—Urethral discharge may indicate:—

Cancer Urethra .....irritating and acrid.
Cystitis .....urine turbid or opaque—blood-tinged—ropy.
Suburethral Abscess .....purulent.
Urethritis .....mucoid or purulent.

Uterine.—Uterine discharge may indicate:—

Anteflexion .....non-irritating—white and more or less profuse.
Cancer, Body .....thin, watery, foul, and profuse, or purulent dirty brown.
Cancer, Cervix .....thin, watery, and profuse, or mucopurulent dirty brown.
Cervical Polypi .....constant—may be profuse, purulent, and offensive.
Endocervicitis .....clear, thick, tenacious, like white of egg.
Endometritis .....thin, serous, purulent or mucopurulent.
Foreign Bodies .....foul-smelling, leucorrheal discharge.
Inversion Uterus .....common—may be purulent and offensive.
Prolapsed Uterus .....non-irritating—white to whitish yellow.
Retroflexed Uterus .....non-irritating—white to whitish yellow.
Subinvoluted Uterus .....leucorrheal.
Uterine Fibroma .....common—generally serous and profuse—may be purulent.

Vaginal.—Vaginal discharge may indicate:—

Cancer, Vagina .....watery and offensive—mixed with blood and pus.
Cysts of Vagina .....leucorrheal or a profuse fetid.
Fibroma of Vagina .....leucorrheal or a profuse fetid.
Foreign Bodies .....profuse, foul-smelling, serosanguinious.
Sarcoma of Vagina .....watery and foul—mixed with blood and pus.
Vaginitis .....thin, white, mucoid—mucopurulent or purulent—yellowish or greenish color.

HEMORRHAGE.

Urethral.—Urethral hemorrhage may indicate:—

Cystitis .....ulcerative form.
Prolapsed Urethral Mucosa
Urethral Caruncle .....slight or profuse.
Urethritis .....slight.
Vesical Calculus .....not infrequent—slight.
Vesical Tumors .....usually first symptom presented.

Uterine.—Uterine hemorrhage may indicate:—

Adenoma Malignum .....less profuse than in cancer.
Cancer, Body .....intermittent and copious or constant and dribbling.
Cancer, Cervix .....slight or profuse—ulcerative stage.
Deciduoma Malignum .....intermittent—usually severe.
Ectopic Gestation .....accompanied by shreds.
Endometritis .....menorrhagia or metrorrhagia.
Fibroid Polypi .....menorrhagia or metrorrhagia.
Fibro-sarcoma .....similar to hemorrhage in cancer.
Inversion Uterus .....profuse—may be fatal.
Lacerated Cervix .....slight or profuse.
Oöphoritis, Chronic .....menorrhagia—frequent in cystic ovary.
Ovarian Cyst .....menorrhagia common.
Retrodisplacements .....menorrhagia.
Salpingitis .....menorrhagia.
Simple Cysts of Ovary .....occasionally menorrhagia or metrorrhagia.
Subinvolution Uterus .....menorrhagia.
Uterine Fibroid .....menorrhagia or metrorrhagia.
Uterine Prolapse .....menorrhagia in early stages.

PAIN.

Crural.—Crural pain may indicate:—

Oöphoritis	referred from iliac region.
Ovarian Cyst	referred from pelvis.
Parovarian Cyst	referred from pelvis.
Prolapsed Ovary	referred from pelvic or iliac region.
Prolapsed Uterus	frequent.
Retroverted Uterus	referred from pelvis.
Salpingitis	referred from iliac region.

Head.—Pain in the head may indicate:—

Endometritis	not uncommon—vertical or occipital.
Lacerated Cervix	vertical.
Ovarian Cyst	vertical or occipital.
Parovarian Cyst	vertical or occipital.
Prolapsed Uterus	common—vertical or occipital.
Retroversion Uterus	very common—vertical or occipital—varies in intensity—aggravated by monthly periods.
Subinvolution Uterus	common—vertical or occipital.
Superinvolution Uterus	vertical or occipital.
Uterine Fibroid	neuralgic—referred from pelvis.

Hypogastric Region.—Pain in the hypogastric region may indicate:—

Cystitis	may be cutting and tearing—referred at times to the perineum, sacral region, along urethra, down the thighs or in the groin.
Distended Bladder	intense weight and fullness.
Dysmenorrhea:—	
(*a*) Inflammatory	precedes flow by several days—may cease when flow begins or continue throughout period.
(*b*) Mechanical	commences insidiously, attains climax and ceases suddenly.
(*c*) Membranous	paroxysmal and expulsive.
Ectopic Gestation	acute, colicky, agonizing, and excruciating—may be referred to iliac region—usually occur about eighth week and are irregular.
Endometritis	dull and aching—may be associated with pains in lumbo-sacral, iliac, or occipital regions.
Irritable Bladder	weight or pressure and bearing-down sensation—may be dull, heavy, tensive, or aching.
Vesical Calculus	same as cystitis—aggravated during and after micturition.

Left Iliac Region.—Pain in the left iliac region may indicate:—

Ectopic Gestation .....**may be acute, colicky, agonizing, and excrutiating—often felt in hypogastrium —usually appears about eighth week—irregular in character.**

Oöphoritis .....**acute, burning, or lancinating—increased at menstrual period—may radiate to lumbo-sacral region, thigh, bladder, or rectum—reflex pain may be felt under breast.**

Ovarian Neoplasms .....**bearing down or dragging in character—may radiate to hip, back, rectum, or down thigh—reflex pain often felt in one breast and in the head.**

Parovarian Varicocele .....**may be dull, burning, or dragging in character, radiating towards kidney—increased by erect posture and exercise.**

Prolapsed Ovary .....**varies from a dull, heavy ache to a sharp, agonizing sensation—usually referred to normal site of ovary, regardless of the position of the organ—increased by erect posture, coitus, urination, and defecation—may radiate to hip, lumbo-sacral region, rectum, or down thigh—reflex pain may be felt under corresponding breast.**

Salpingitis .....dull and heavy or acute and agonizing—increased by erect posture—may radiate to lumbo-sacral region or down thigh.

Lumbo-Sacral Region.—Pain in the lumbo-sacral region may indicate:—

Cancer Cervix Uteri.....constant or paroxysmal—dull, gnawing, burning, or shooting.

Cancer Corpus Uteri .....dull, heavy, shooting, and burning.

Inversion of Uterus .....dull and heavy.

Lacerated Cervix .....due to associate lesions.

Oöphoritis .....referred from iliac region.

Ovarian Cyst .....referred from iliac region.

Parovarian Cyst .....referred from pelvic region.

Prolapse of Ovary .....referred from iliac or pelvic region.

Retroversion Uterus .....common—dull and heavy—aggravated by exercise or erect posture.

Salpingitis .....usually referred from iliac region.

Subinvolution Uterus .....dull and heavy.

Superinvolution Uterus .....common.

Uterine Fibroid .....localized.

Pelvic Region.—Pain in the pelvic region may indicate:—

Cancer, Cervix Uteri .....similar to cancer corpus uteri.
Cancer, Corpus Uteri .....not marked in early stage—later on may be constant or intermittent—shooting, burning, or colicky—may be referred to lumbo-sacral region, lower abdomen, and down the legs.
Cancer, Vagina .....usually present in later stage—may be referred to rectum, bladder, or along the sciatic nerves.
Cystocele .....weight and dragging in erect posture—absent in recumbent position.
Fibroid Polypi .....colicky and expulsive.
Imperforate Hymen .....may be fullness and weight, with colicky pains.
Inversion of Uterus .....severe in acute form—bearing down, dragging, or weight in chronic form—may be referred to lumbo-sacral region.
Lacerated Cervix .....weight or bearing down—lumbo-sacral pain and vertical headache.
Prolapse of Uterus .....bearing down or dragging—may be referred to rectum, lumbo-sacral region, or down the thighs—increased by erect posture and violent exercise—headache a common symptom.
Rectocele .....weight and dragging in erect posture—absent in recumbent position.
Retroversion of Uterus .....weight or dragging—may be acute if the appendages are prolapsed—referred to back, rectum, and down the thighs—headache common.
Sarcoma Vagina .....same as in cancer of the vagina.
Subinvolution Uterus .....bearing down or weight—referred to lumbo-sacral region and head.
Uterine Fibroid .....fullness and weight—localized pain in lumbo-sacral region—may be referred to abdomen, head and lower extremities.
Vaginitis .....fullness—in acute form, throbbing in perineum and backache—exaggerated by bodily exercise.

Rectum.—Pain in the rectum may indicate:—

Anal fissure.
Cancer, Cervix Uteri .....in ulcerative stage.
Cancer of rectum.
Cancer, Vagina .....more or less constant in late stages.
Fistula in ano.

Rectum.—(*Continued.*)

Hemorrhoids.
Oöphoritis ..... **referred from iliac region.**
Ovarian Cyst ..... **referred from pelvic or iliac region.**
Parovarian Cyst ..... **referred from pelvic region.**
Prolapsed Ovary ..... **increased during defecation.**
Prolapsed Uterus ..... **fullness and tenesmus.**
Rectocele ..... **tenesmus usually present.**
Retroversion Uterus ..... **fullness.**
Sarcoma Vagina ..... **more or less constant in late stages.**

Right Iliac Region.—Pain in the right iliac region may indicate:—

Appendicitis ..... **begins with sudden pain, usually at or near navel, but may be located at any point in abdomen—colicky, sharply defined, or diffuse—later on centers at McBurney's point.**

Ectopic Gestation ..... **may be acute, colicky, agonizing, and excruciating—often felt in hypogastrium —usually appears about eighth week—irregular in character.**

Oöphoritis ..... **acute, burning, or lancinating—increased at menstrual period—may radiate to lumbo-sacral region, thigh, bladder, or rectum—reflex pain may be felt under breast.**

Ovarian Neoplasms ..... bearing down or dragging in character—may radiate to hip, back, rectum, or down thigh—reflex pain often felt in one breast and in the head.

Parovarian Varicocele ..... may be dull, burning, or dragging in character, radiating towards kidney—increased by erect posture and exercise.

Prolapsed Ovary ..... varies from a dull, heavy ache to a sharp, agonizing sensation—usually referred to normal site of ovary, regardless of the position of the organ—increased by erect posture, coitus, urination, and defecation—may radiate to hip, lumbo-sacral region, rectum, or down thigh—reflex pain may be felt under corresponding breast.

Salpingitis ..... dull and heavy or acute and agonizing—increased by erect posture—may radiate to lumbo-sacral region or down thigh.

Sciatic.—Sciatic pain may indicate:—

Cancer, Cervix Uteri .....referred from pelvis.
Cancer, Vagina .....late stage—radiating from pelvis.
Oöphoritis .....referred from iliac region.
Ovarian Cyst .....referred from pelvis.
Parovarian Cyst .....referred from pelvis.
Prolapsed Ovary .....referred from pelvic or iliac region.
Salpingitis .....referred from iliac region.
Sarcoma Vagina .....ulcerative stage—radiating from pelvis.
Uterine Fibroid .....referred from pelvis.

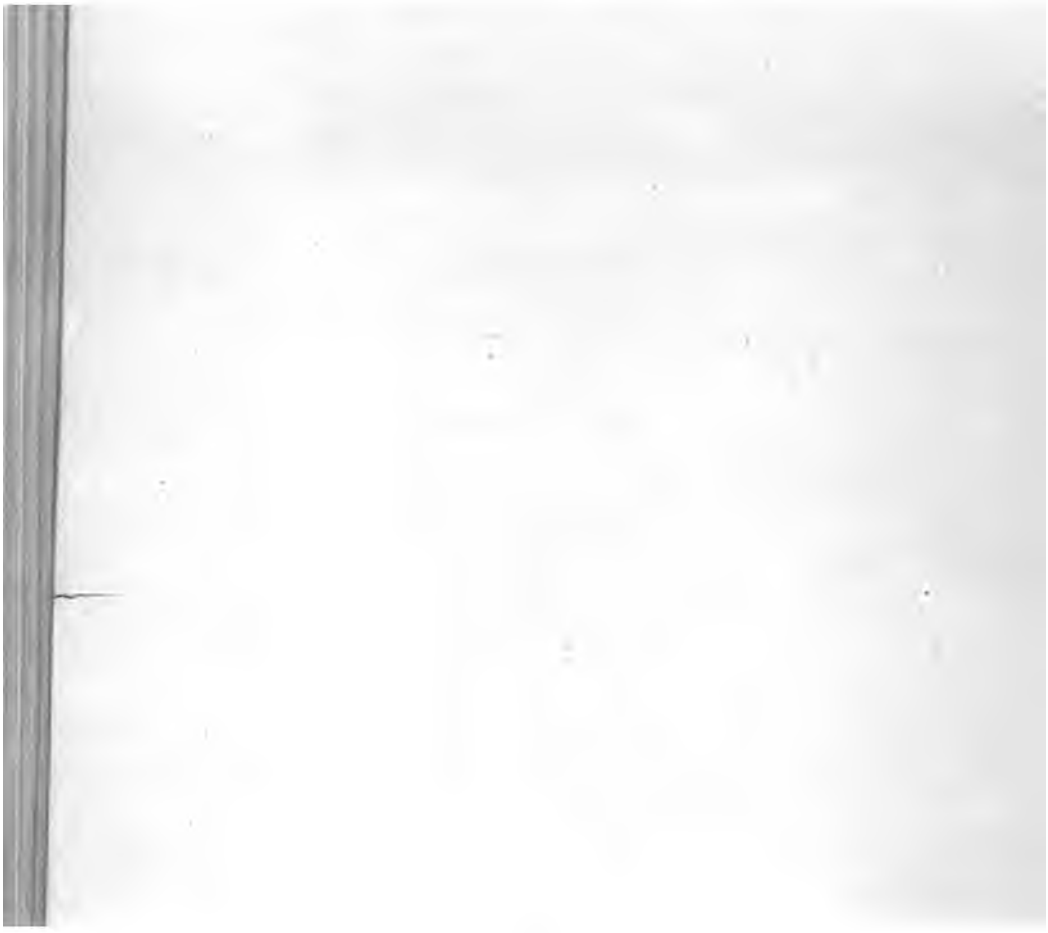
Urethral.—Urethral pain may indicate:—

Prolapse Urethral Mucosa .....during micturition.
Suburethral Abscess .....common during micturition.
Urethral Caruncle .....slight or agonizing during micturition.
Urethritis .....itching—burning.
Vesico-urethral Fissure .....acute, burning, or tenesmus—during and after micturition.

PAINFUL MENSTRUATION.

Painful Menstruation may indicate:—

Anteflexion .....paroxysmal and expulsive.
Cervical Polypi
Cervical Stenosis, acquired .....paroxysmal.
Endometritis:—
(*a*) Congestive .....in hypertrophied form.
(*b*) Membranous .....severe—mitigated on expulsion of membrane.
Fibroma Ovary .....may be present.
Parovarian Cyst .....early and obstinate symptom.
Prolapsed Ovary .....often present.
Retroflexed Uterus, congenital
Salpingitis .....common—one week before flow, ceases several days after.
Superinvolution .....in menstruating women.



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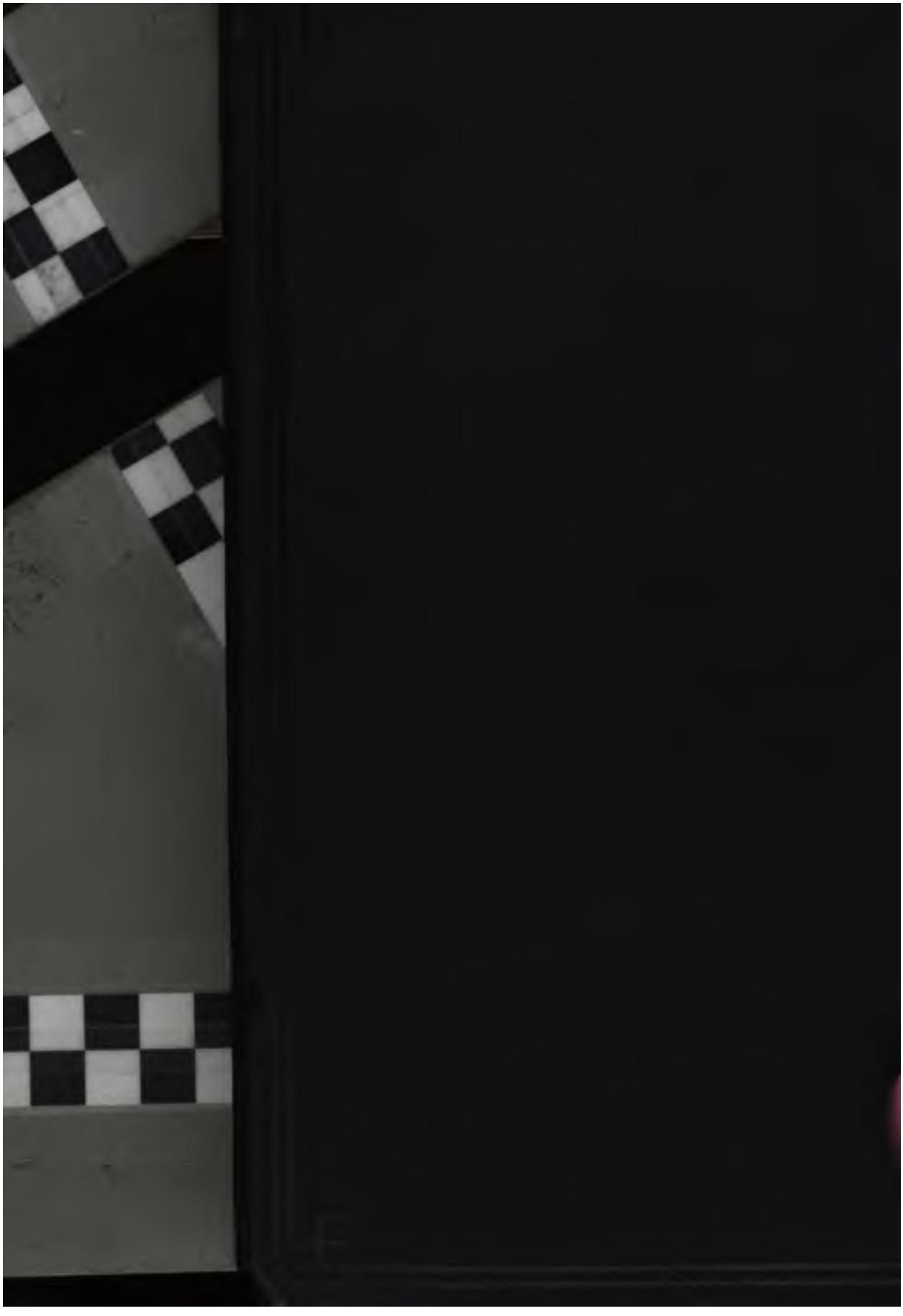
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